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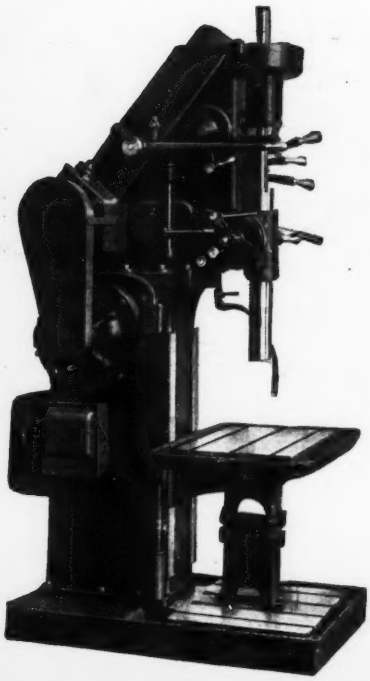

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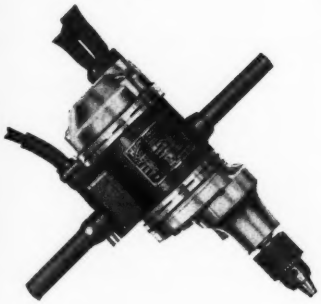

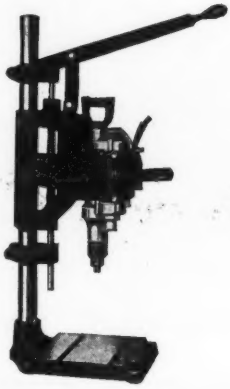

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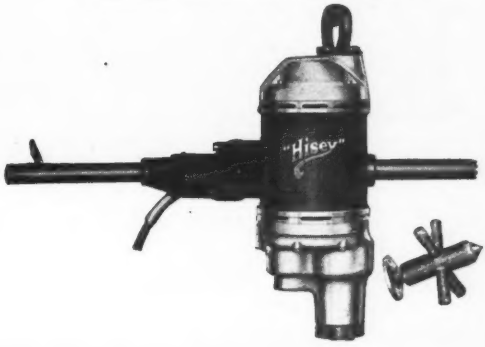

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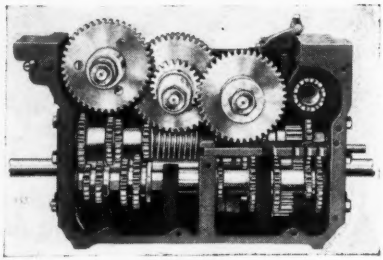

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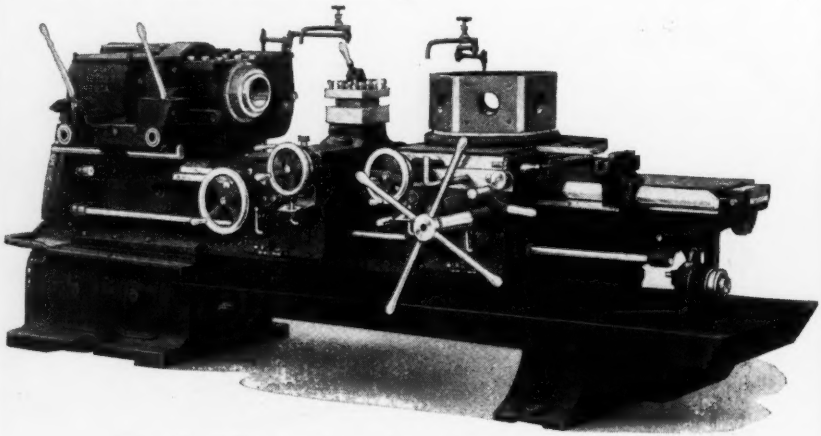

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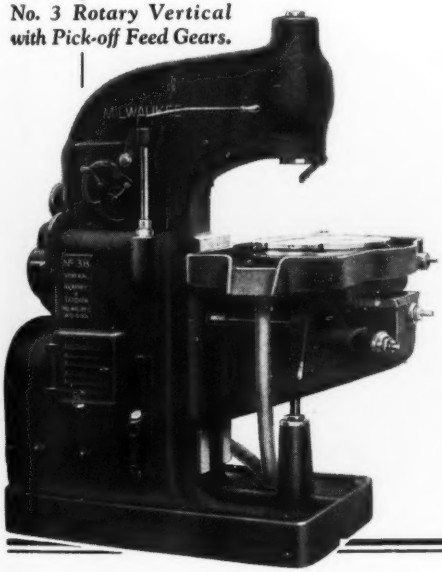
No. 3 Rotary Vertical with Pick-off Feed Gears.



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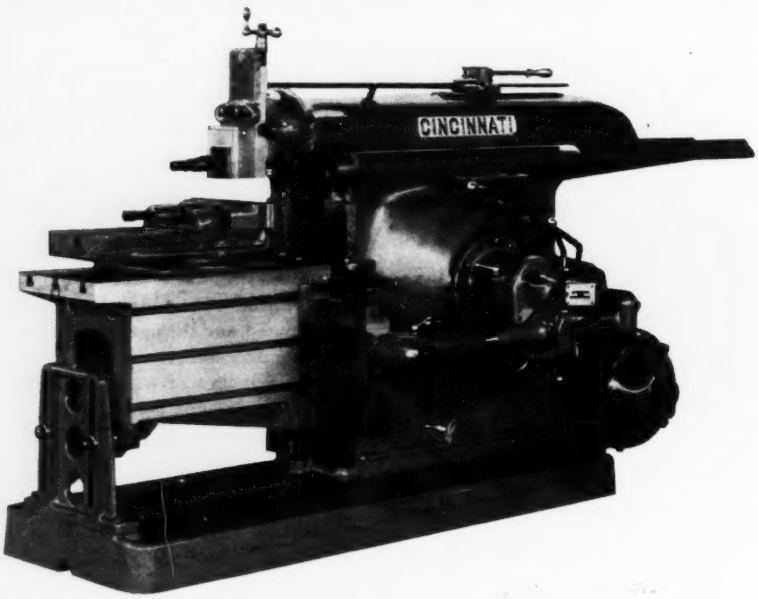

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Rapid Traverse

MODERN
Machine Shop

A MAGAZINE FOR MACHINE SHOP EXECUTIVES

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Vol. 1 SEPTEMBER, 1928 No. 4

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MODERN
Machine Shop

SEPTEMBER, 1928

CINCINNATI, OHIO VOL. I, NO. 4

A "Modern Machine Shop"

By HOWARD CAMPBELL

This article describes a tool, die and jobbing shop that has built a successful business by having the equipment to handle any job that came along.

SOME twenty-five years ago a "job" shop was opened in Dayton, Ohio, under the name of The City Machine & Tool Works. Fortunately for the future of the shop, very early in its career the owners adopted a policy of taking every first-class job that was offered, immediately acquiring the necessary equipment to handle the job. This policy could have but one result; it was only a matter of time until the shop was equipped to handle any kind of work available, and manufacturers who do not care to maintain their own experimental departments, or who periodically have more tool work than their shops can handle, soon found this out.

At the present time the shop is making drop forging dies for a forge plant,

Fig. 1—Individual work-benches are arranged next to the windows. (7)

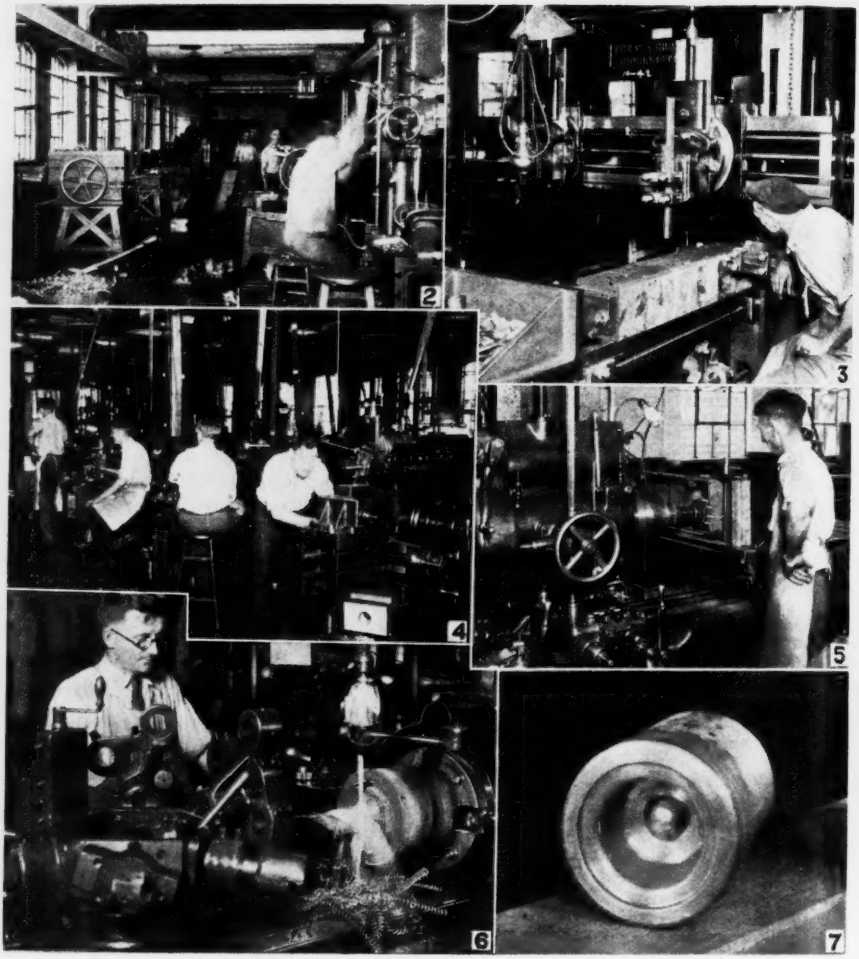


Fig. 2—One side of the shop is equipped with a crane for floor work. Fig. 3—Machining die-blocks on a planer. Fig. 4—Small work and single pieces are handled on the shapers. Fig. 5—The horizontal boring mill is an important machine in a shop of this type. Fig. 6. Machining a forging die, using a screw machine and special fixture. Fig. 7—The finished die.

jigs for a manufacturer of automotive parts, jigs and tools for one of the large automobile manufacturers, machine parts for a machine tool manufacturer, and various other similar jobs. All of which is evidence that there is plenty of business for the shop that is equipped to handle it, and manned by an organization of men who know their business. As Mr. L. F. Poock, president of the company, says, "Equipment brings business—but you have to have the equipment. Customers want to see

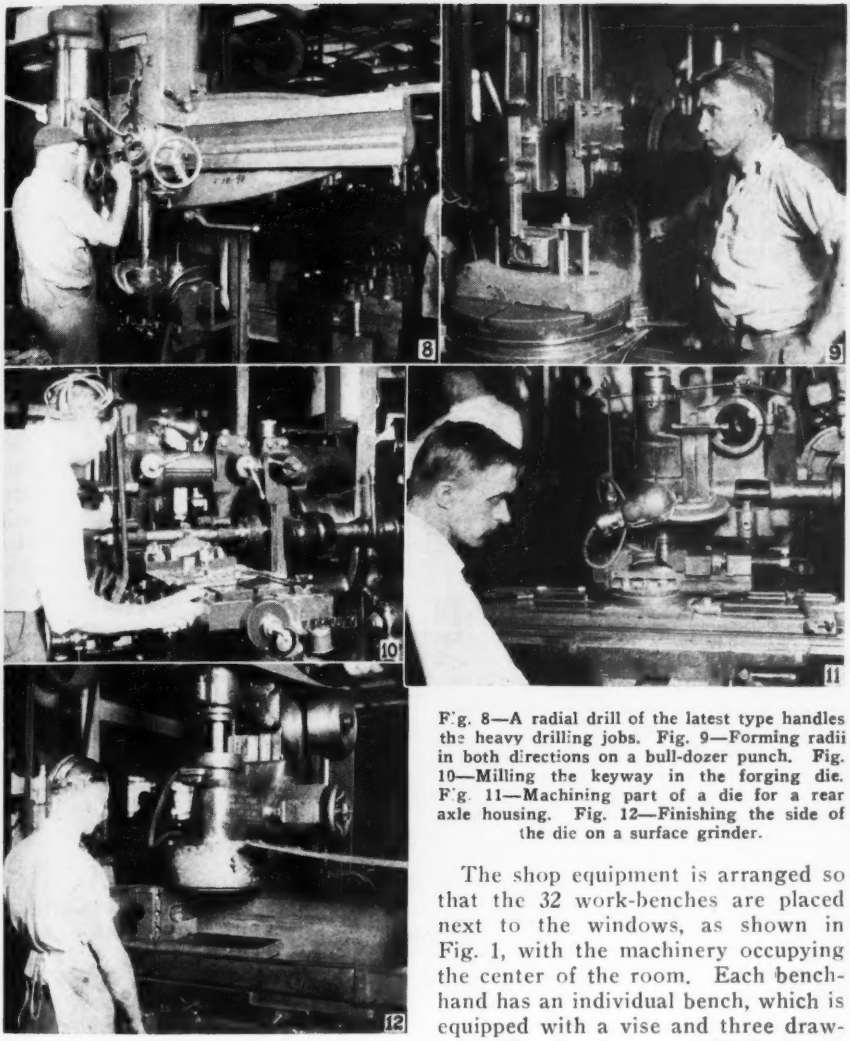


Fig. 8—A radial drill of the latest type handles the heavy drilling jobs. Fig. 9—Forming radii in both directions on a bull-dozer punch. Fig. 10—Milling the keyway in the forging die. Fig. 11—Machining part of a die for a rear axle housing. Fig. 12—Finishing the side of the die on a surface grinder.

your shop before they give you their business."

In order to give customers the best service possible, the shop is equipped with a drafting room, and private offices are available for the use of the customers' representatives.

The shop equipment is arranged so that the 32 work-benches are placed next to the windows, as shown in Fig. 1, with the machinery occupying the center of the room. Each bench-hand has an individual bench, which is equipped with a vise and three drawers. He also has an individual surface-plate, each plate resting on a portable stand so that it can be moved about as convenience dictates.

The tool and die-makers' benches occupy three sides of the room, the fourth side, Fig. 2, being equipped with a hand-operated overhead crane

for floor work. The heavier machines are also located along this aisle so as to be available to crane service. The larger equipment includes two planers of different sizes, one of which is shown planing a line of six die-blocks in Fig. 3. Large pieces and quanti-

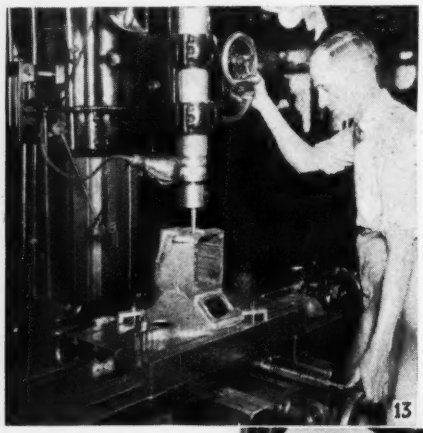


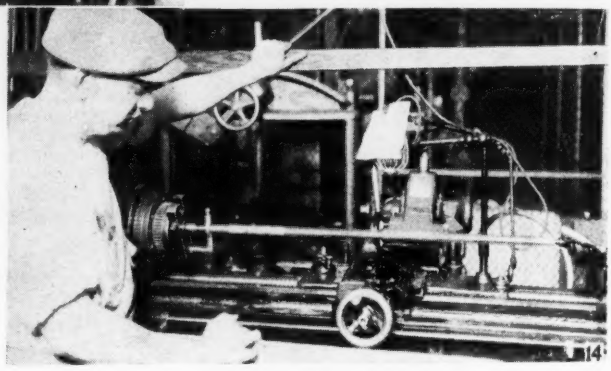
Fig. 13—Boring an experimental piece in a jig-boring machine. Fig. 14—The thread-miller is fast and accurate.

ties are machined on the planers, a line of shapers, Fig. 4, providing for single pieces with flat surfaces to be finished.

Large pieces with holes to be bored or odd-shaped surfaces to be machined are finished on the Lucas horizontal boring mill, Fig. 5. The machine is shown milling a bed for an automatic armature-winding machine.

The mechanic shown in Fig. 6 is machining a die similar to that illustrated in Fig. 7, using a screw machine with a special fixture which allows the chuck-jaws to grip the piece at the rear end, and which provides for centering and holding the piece by means of screws at the front end. Special fixtures, tools or chucks are used whenever the required time can be cut and costs lowered by their use.

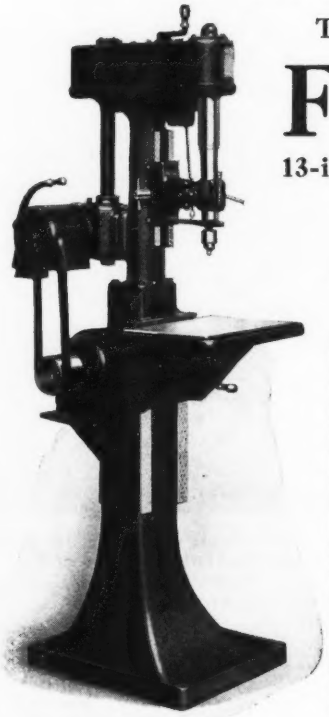
Heavy drilling work is handled on the radial drill illustrated in Fig. 8. The machine is shown drilling a 1⅝-inch hole in a die block. A slotter is shown in Fig. 9, forming a punch for a bull-dozer. The face of the piece is radial in both directions, a 4-25/32-inch radius being required in one plane, and a 17½-inch radius in the other. The first radius is formed by locating the piece correctly on the table so that the radius is obtained by revolving the table slightly between strokes of the ram. The 17½-inch radius is obtained by the vertical action of the ram, which is controlled by a cam plate, attached to the side



of the column, and a roller which is attached to the ram. As the ram moves up and down, the roller rides in a groove between two curved pieces on the cam plate, the ram being released so that it can follow the curve. As the roller is a good fit in its groove, a good job is obtained.

Figure 10 shows one of the two No.

Stop throwing money away on small drills!



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Adjustable Feed Lever. The feed lever is adjustable to various positions for convenience of operation. A quick return star wheel enables the operator to feed, return, or position the drill rapidly with either hand.

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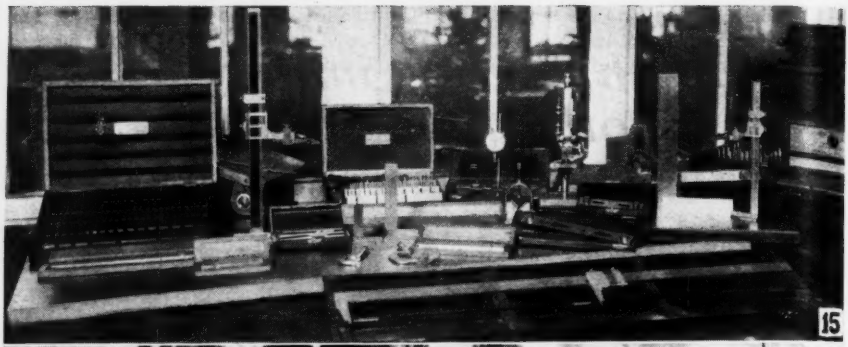

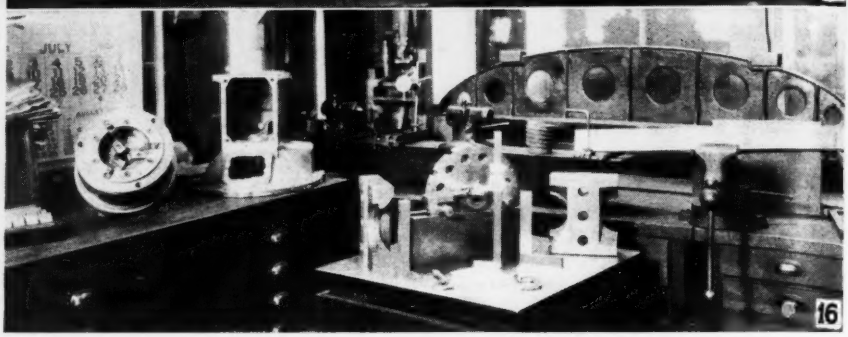

Fig. 15—A complete set of inspection tools provides for accurate work. Fig. 16—Corner of inspection room, showing bench centers and other tools.

3H LeBlond milling machines, in use for milling a ½-inch keyway in a forging die. These machines will handle practically any milling job that comes into the plant. Profiling operations on dies or similar work are performed on a machine similar to that shown in Fig. 11, of which there are several in this plant. The piece in the machine is a part of a die for a rear axle housing.

The plant is equipped with grinding machines of all types, including a couple of surface grinders similar to the one illustrated in Fig. 12. Here a mechanic is just about to finish the surface of a forging die.

Boring operations on experimental pieces and tool work are performed in the Pratt & Whitney jig-boring machine shown in operation in Fig. 13. The piece in process is an experimental transmission case for an automobile manufacturing plant.

Lead-screws for machine tools must be as nearly perfect as possible, consequently a thread milling machine, Fig. 14, is used for this work. The machine is milling an Acme 5-P square thread on the piece shown.

Accuracy of the kind that is required on the work that is produced in this shop can only be maintained by the use of inspection equipment of the finest type, such as that shown in Figs. 15 and 16. The gauges are, in themselves, an indication of the class of work that is turned out in this shop. Here is a "small shop" that is growing up by being properly equipped.

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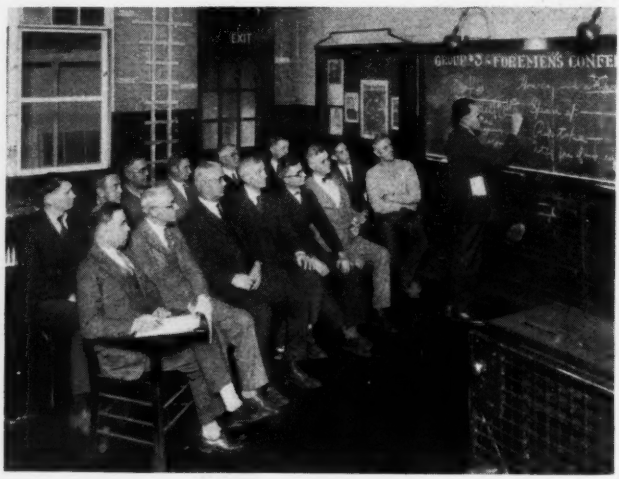
Operation of Foremen's Conference at Jeffrey Manufacturing Company

By PHILIP WINTER

THE foreman is the "top sergeant" of industry. Orders may originate anywhere along the line of officers, from the president down, but the foreman is the one who sees that the orders are followed out and the work is done. And getting it done may mean that he is responsible for both the quantity and quality of the work that is turned out by the men in his department, responsible for the operation and care of thousands of dollars worth of machinery and equipment, and responsible for the successful cooperation of his department with the other departments of the plant.



Foremen's Conference in session at the Jeffries plant.

The last item being by no means the least, a foremen's conference was inaugurated at the plant of the Jeffrey Manufacturing Co., some two years ago, for the purpose of making the foremen better acquainted with each other, to give them an opportunity to iron out problems of common interest in the daily routine, and to promote the exchange of ideas by discussion.

In order to set the machinery in motion, the general superintendent, Mr. H. W. DeBruin, appointed a chairman who selected a committee to organize the conference. The committee is composed of eight of the 85 foremen and assistant foremen, and four of these eight are changed each year so that every one will have a chance to serve on the committee. The committee organized the foremen into five groups of from 16 to 18 men each, and arranged to have one group meet each day of the week from 4 to 5 p. m. The idea of dividing the organization into small groups was based on the idea that men will speak more freely in a small group than they will in a large one, and the primary object of the conference is to obtain the opinions of every man in the organization. By having a different group meet each day, only a

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small number of the foremen are away from their departments at a time. The meetings are held every alternate week.

A conference leader acts as chairman for each group, but he takes very little part in the discussion. His duties consist principally of confining the discussion to the subject in hand and keeping the conference running smoothly. If he has an idea to contribute, however, he offers it as one of the group and makes his part of the discussion as brief as possible. This throws the responsibility for the success of the conference on the members and better results are obtained than would be possible if the conference leader did most of the talking.

The committee selects the topics for discussion, and an effort is made to introduce important problems at the proper time. A list of the subjects discussed during the first year is as follows:

1. Old and new types of industrial organizations, and our responsibilities as foremen.
2. Instructing and interesting the worker.
3. Why the Employment Department?
4. Records and their value.
5. Scheduling and despatching.
6. What should our book of rules contain?
7. Maintaining quality.
8. The value of safety work.
9. Discipline.
10. An intelligent order.
11. Leaks and losses.
12. Co-operation.
13. Materials.
14. Inventory and expense.
15. Expense numbers and what they cover.
16. The service the customer demands.
17. The placing of stock orders.
18. The value of suggestions.
19. Are we doing our best during the business depression?
20. How can we economize in our power consumption?
21. Our gain share methods.
22. The value of inspection.
23. Passing the buck.
24. Making the job safe for workers.
25. Cutting costs.
26. Are we 100 per cent in conference work?
27. What has our conference accomplished on power consumption, service to customers, orderly conditions in the shop, safety, expense, and discipline?

In opening the discussion on the subject of "Co-operation," which was one of the most important topics of the year, the leader reminded the groups that co-operation is one element that is absolutely necessary to the maintenance of a successful organization; that the elements discussed in previous conferences are important parts of such an organization but that co-operation is the "keystone" of the structure. The various groups then defined co-operation as follows: Working together for a common good; helping each other; working collectively; working together for mutual benefit; operating as one; the co-ordination of ideas and efforts for betterment.

To make the idea more graphic, the leader drew two lines on the blackboard to illustrate the two kinds of co-operation; a vertical line to indicate co-operation with superior executives and management, and a horizontal line to indicate co-operation with the other foremen and the working force. In a discussion of the factors that hinder co-operation, the following points were brought up: (1) selfishness; (2) jealousy; (3) "passing the buck," either to the management, by blaming the material, or blaming the tools and equipment; (4) bullheadedness; (5) antagonism; (6) destructive criticism; (7) lack of mo-

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rale, interest, courtesy, control, judgment, tact, or diplomacy; (8) friction, due to misunderstanding, wrong attitude, untruthfulness, setting bad example, holding back information, cliques, personal grudges, disloyalty, partiality, inability to handle men properly, with corresponding labor turnover, "knocking," "putting one over" on the other fellow, and "offishness."

The results of poor co-operation or of lack of co-operation were defined as (1) decreased production with increased costs; (2) dissatisfied customers and loss of sales; (3) increase in labor turnover; (4) demoralized organization; (5) reputation of company affected. The last may mean deterioration and even dissolution.

Another subject selected by the committee was "Maintaining Quality." In response to the opening question "What is to be gained by maintaining quality?", the following replies were given: (1) a higher standard of value and, therefore, higher prices; (2) maintenance of quality should stimulate the sales department to bring in increased business; (3) a reputation for quality is a great asset to any company, and means satisfied customers; (4) high quality engenders personal pride, produces a high morale, and develops a contented organization; (5) quality is synonymous with interchangeability of parts, which reduces trouble in the field.

The next question submitted was "What can and should be done to maintain quality?" In answering this question, the members thought that the foreman should (1) analyze the job before starting; (2) give close supervision and instruction; (3) have the right man on the job; (4) encourage the worker to take more pride in his work; (5) bear in mind that all production, whether by mechanical means or hand labor, is controlled by the human factor; (6) check each operation, instruct operators to report troubles as they occur, and keep in touch with the job at all times; (7) keep posted on modern methods and use them; (8) check for revised drawings and correct information.

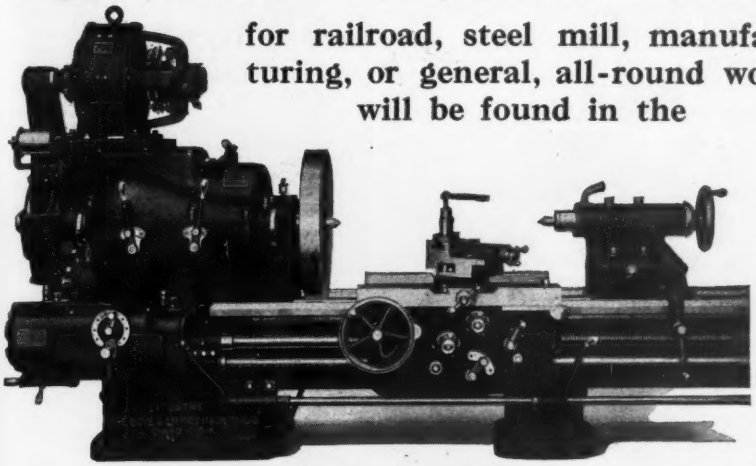
Lack of quality as evidenced by defective work was attributed to (1) carelessness; (2) lack of information, instruction, investigation, supervision; (3) use of improper tools; (4) faulty equipment; (5) inexperienced men; (6) too much speed; (7) indistinct drawings; (8) orders not written correctly. All of the above affect (1) production, by causing a break in the schedule; (2) sales, through late deliveries; (3) customers, by causing them financial loss; (4) costs, due to tearing down and setting up equipment; (5) earnings of the company, by reducing the profits; (6) earnings of the worker, because low profits mean less wages, and (7) morale, as the efficiency of the worker, department, and organization is lowered.

Discussion of the topic "Discipline" brought out the fact that discipline is of three kinds: nature's discipline, imposed by nature; self discipline, imposed by ourselves; line discipline, imposed by others on us and through us on others. In response to the question "What are the tangible breaches of discipline?", the answers given were: (1) tardiness, (2) carelessness, (3) disregard of safety devices, (4) washing before quitting time, (5) starting to the cafeteria before quitting time, (6) failure to have injuries properly cared for at the hospital, (7) disregarding fire regulation, (8) visiting during working hours, (9) laying off without notice, (10) washing hands in oil, (11) kidding and horseplay, (12) changing clothes before quitting time. The question "What are the intangible breaches of discipline?" brought out the following answers: (1) spreading dis-

(Continued on page 34)

All you have wanted in a lathe

for railroad, steel mill, manufacturing, or general, all-round work will be found in the



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Designed for service and built to a high standard of accuracy, this lathe will prove an economy and a source of never-ending satisfaction over a period of years.

Highest spindle speed is lower than initial drive shaft speed with no step-up speed in any gear combination, assuring a maximum of power at the cutting tool.

The officials of a railroad that is using 103 Boye & Emmes lathes state that they "have never ordered a repair part, although some of these machines have been in use over 25 years."

Let us tell you what some big-plant executives say about

"The Lathe With the Longer Life"

Sizes from 18-inch to 36-inch Swing

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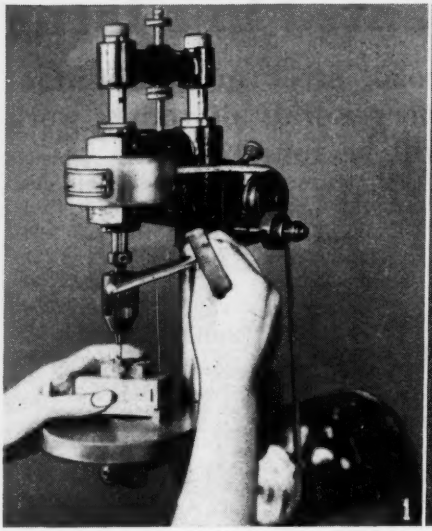

Fig. 1—Drilling parts for watch cases.

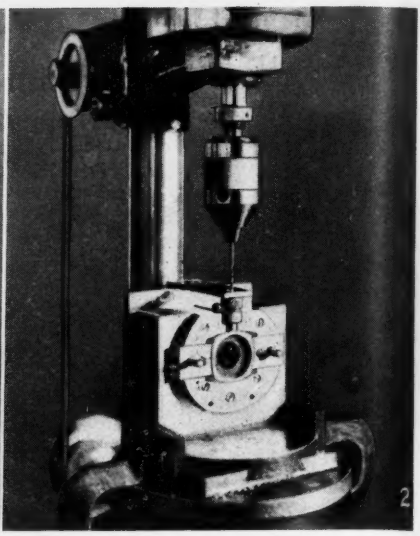

Fig. 2—Drilling the hole for the stem.

Interesting Applications of a Sensitive Drilling Machine

IT HAS BEEN estimated that, of all the millions of holes that are drilled every day, the majority are under ¼-inch in diameter. Some are very much under; there are automobile parts in which holes are drilled as fine as No. 70, which is .028 inch in diameter, and in such intricate mechanisms as the works of a watch, holes will be found that are less than .003 inch in diameter — and they were drilled with steel drills. Anyone who has ever drilled any small holes will readily understand why one watch factory uses more than a million of these fine drills per year. Some of the holes are tapped for screws which are so small that 20,000 of them will go into a thimble.

The drilling of very small holes is a delicate operation, the success of the operation depending both on the skill of the mechanic and the stability and sensitiveness of the drilling machine. The difference in machines is well illustrated by the experience of a mechanic who had a number of small parts to drill with a No. 63 (.031) drill. After breaking more than a gross of drills, he changed machines and then drilled 15,000 holes without breaking a drill.

The illustrations in this article show a variety of operations in the machining of watch-cases, all of which are performed on sensitive drilling machines. The operation shown in Fig. 1 is of the common type—drilling a No. 56 (.046) hole for the hinge-pin. The jig is of the box-type, the lid be-

(Photographs and data courtesy Adolph Muehlmatt)

Job is done on 20" or 22" single spindle drill press. Pieces are brought to machine in the rough with small cord holes properly placed. Drilling is done with 29/32" Cle-Forge High Speed Drills (we make them, too) on a centre distance of .001". Peerless Reamers No. 516 of 15 16" size are used for finishing.

Speed is 360 r. p. m. Cutting is at rate of 88.4 f. p. m. Hand feed is used. Average reaming time is 6 seconds. Plug gages are used in checking finished work and diameter tolerance of .001" is rigorously adhered to.

THIS REAMER

Saves 5 Times Its First Cost!

OVER a 10 year period a certain manufacturer of hydraulic hoists tried practically every drill and reamer on the market to find the best suited and most economical tool for his work.

The use of "Peerless" Taper Shank Expansion Chucking Reamers to finish two 15/16" blind holes 1½" deep in a cast iron pump cover plate is typical of "Peerless" performance.

Solid reamers previously used produced about 1400 holes at a cost of .0021 each. "Peerless" Reamers produce 7200 holes at a cost of .0005 each—a saving of .0016 per hole, or 76%!

Further, "Peerless" design permits grinding down for use in smaller holes after the 15/16" run—and this second period of service is also about 7200 holes!

Hence, on this one job "Peerless", with a life of 14,400 holes, saves $23.04—*or about five times the first cost of each reamer!*

Other "Peerless" advantages—outlined by the user—are:

(1) Smoother work with less chattering.
(2) Breakage rare and never shattering.
(3) Work speed never limited by the reamers.
(4) Adaptability to special oversize work.
(5) Smaller tool stocks required.
(6) Uniformly high quality and accuracy.

May we send you complete details of this performance? Simply ask for Digest No. 54.

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Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers, "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers. "Spirex" Machine Taper Pin Reamers, Chucking Reamers for Turret Lathes Counterbores; Countersinks, Sockets, End Mills, and the "Ezy-Out" Screw Extractor

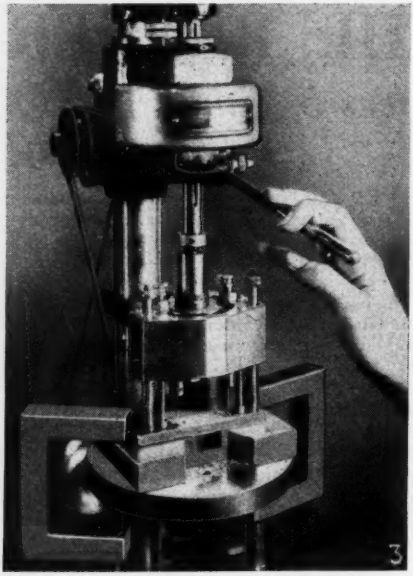

Fig. 3—Using a two-spindle head on a sensitive drilling machine.

ing hinged at one end and carrying the bushing. When the lid is in place, it automatically clamps the piece in position. As there are more than 2,000 different models of watch cases made in this plant, the tooling must be semi-automatic whenever possible,

Fig. 4—Watch case bow drilled on the machine shown in Fig. 3.

and very flexible. The chucking time is the largest factor, consequently the jigs and fixtures must be as simple as possible.

The illustration Fig. 2 shows a gold watch case center in place for drilling the hole for the stem. The case is held in position by two clamps which can be quickly slid into position. Pins projecting from the clamps serve as handles. A No. 48 drill is used, running at a speed of 1,880 r. p. m., and guided by a bushing that is anchored permanently in place.

A multiple drilling job is shown in Fig. 3, where two No. 60 (.040) drills can be seen in process of drilling a bow for a standard type watch case. The holes are drilled near the ends of the bow, as shown in Fig. 4, and the drills penetrate to a depth of 1/16 inch. The drill spindles are driven through a set of gearing which is actuated by the spindle of the machine, the driving gear being attached to a shaft that has a taper shank which fits into the machine-spindle. The drill spindles and the shafts that carry the driven gears are all adjustable, so that the drills can be spaced according to the requirements of the job. The piece locates in a slot in the top of the baseplate of the fixture, and is held in place by a clamp that is attached to the drill head. Pressure is applied by

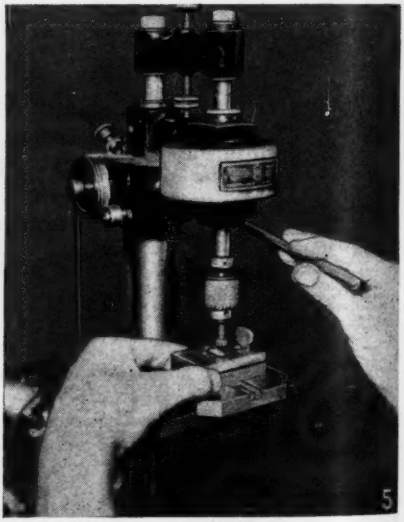

Fig. 5—Milling clearance in the wall of a watch case.

Centralized Control

MEANS MORE HOLES

The SUPER—
SERVICE *Radial*

NO WASTED LEGWORK

No time is lost in walking from one end of the machine to the other for each change in spindle speed or location. The operator controls 36 speeds, 18 feeds, power column clamping and power rapid traverse without moving from the spindle.

The Cincinnati Bickford Tool Co.

OAKWOOD, CINCINNATI, OHIO

springs, as shown, the clamp striking first when the head is lowered, and releasing the piece after the drills have been withdrawn.

Some of the wrist watches are so small and compact that the works fit into the cases with not more than .0002 inch clearance, one type having a wheel projecting from the works in such a manner that clearance is required to be milled in the wall of the case center in order to allow the works to fit in properly. The milling operation is performed with the aid of the tools shown in Fig. 5. The piece is located in a jig, as shown in Fig. 6, the cover serving both as a clamp and as a guide for the tool. The tool is a 7/16-inch milling cutter attached to a shank that is held in the chuck. When the piece is in position, the tool is lowered through the slot in the jig-cover and the jig is pulled over until the end of the slot strikes against the tool-shank. In this position the cutter mills approximately .012 inch out of the wall of the case. The entire operation of locating the piece, milling, and removing the piece takes less than 20 seconds.

The tools for performing a much more complicated operation—that of milling the nibs on a watch case bow

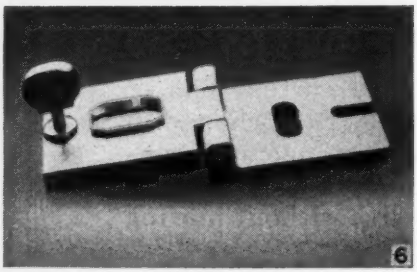

Fig. 6—The watch case, after the clearance has been machined.

—are shown in position in Fig. 7. Each nib is finished to a diameter of .060 inch, for which the double-end rose mill shown in the insert is used. The tool is shown magnified approximately nine times, the actual size of the cutter being ¼-inch length by

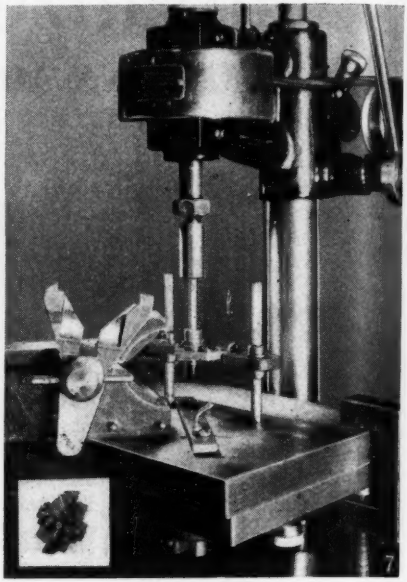

Fig. 7—Equipment for milling the nibs on a watch case bow. Insert—Magnified illustration of the rose-mill with which the operation is performed.

3/16-inch diameter. The tool is located in the corner of a three cornered flat horizontal housing in which is also located a train of small gears through which the power is applied. The driving gear is keyed to a shaft that locates in the machine spindle. As can be seen in the illustration, teeth are cut on the periphery of cutter; thus no shaft is required and the tool can cut with either end. The housing that carries the cutter-mechanism is attached to a plate that rides on guide-pins, as shown, so that the operation of the cutter will be under complete control.

To locate the piece for machining, it is clamped into the block shown on the table, and the block is then lo-

Use the Correct Grinding Wheel

MANY machine shops, both large and small, pay too little attention to the selection of the grinding wheel.

There is a wheel of the correct abrasive and the correct grain and grade for each operation. For example, cylindrical parts of hardened or soft steel and other materials of high tensile strength require a wheel made of the Norton abrasive trademarked "Alundum."

Another Norton abrasive, trademarked "Crystolon," is better adapted for grinding cast iron and other materials of low tensile strength, such as brass, bronze and aluminum.

The success of grinding depends largely on the selection of the right wheel. We shall be glad to help you pick the right one for your job.

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GRINDING WHEELS
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cated in an angle formed by two steel strips that are screwed to the machine-table. The nibs are now in line with the cutter. By lowering the cutter, one nib is machined with the

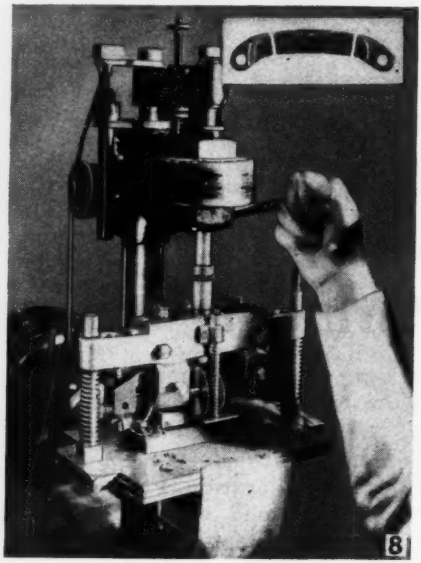


Fig. 8—Sawing a watch case lug into three pieces. The saws can be set at any angle. Insert—Magnified illustration of lug after sawing.

lower end of the cutter, then by raising the cutter the upper nib is machined with the other end. The cutter revolves at a speed of 1,880 r. p. m., and the diameter of the nib is held to a limit of .0005 inch.

An operation in which a sensitive drilling machine is used to operate a pair of saws is illustrated in Fig. 8. In this operation a gold watch case lug is sawed into three pieces, as shown in the insert, this illustration showing the lug magnified approximately nine times. To machine, the operator places the lug in an aperture in the base of the fixture, a clamping plate attached to the housing serving to hold the piece in position as the spindle is lowered. Slots in the plate allow the saws to pass through as operator continues to pull down on the lever.

The cutting tools consist of two 2x.014-inch saws, operating at a speed of 1,400 r. p. m. Power is supplied from the machine-spindle, to which is attached a gear that drives two spur gears, one on either side, each gear on a vertical shaft at the lower end of which is a bevel gear which drives a corresponding gear on the cutter-arbor. Each set of bevel gears is enclosed in a housing that can be turned, making it possible to swing the saws to any angle desired. The spindle can also be adjusted for length. Guide-pins keep the housing properly aligned, and springs serve to raise the saws from the work as soon as the lever is released.

The operations and tools described above may give the reader some idea of the operations that can be performed with a sensitive drill and the right kind of equipment.

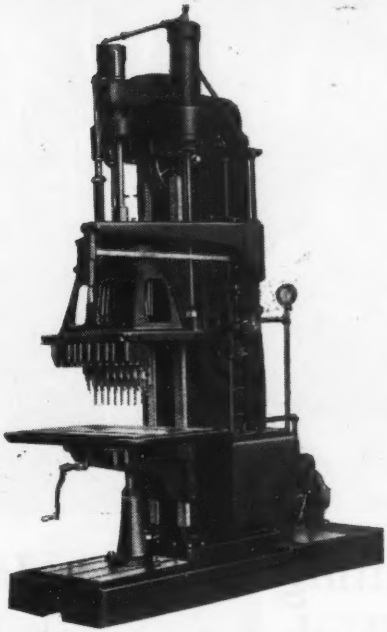
The Electric Welding Arc and the Eyesight

According to C. J. Holslag, in his "Arc Welding Handbook," no one's eyes have ever been permanently damaged as a result of the glare of the electric welding arc.

The effect of the glare of the arc, when one looks directly at it, is to burn out the pigment or tissue in the eye, which generally causes more or less discomfort. Sometimes one who is not familiar with welding equipment will look steadily at the arc, or will glance at it several times. No immediate results may be felt, but several hours later lights will appear as seen through a heavy fog. The proper thing to do when this symptom becomes evident is to go to bed and go to sleep. The eyes may be a bit weak the next morning, but there will be little discomfort.

This is the smallest Hydraulic Feed Multiple Drill built by

NATCO



C13 HYDRAULIC MULTIPLE DRILLER

The model C13H is the smallest vertical multiple spindle driller built by NATCO with a hydraulic feed. This machine is unusually rugged in construction. Cascade lubrication and frictionless bearings are used to insure long life with little attention.

One lever within easy reach at all times completely controls the machine. Machine has a capacity of twelve ½" drills in cast iron at a heavy feed.

NATCO PRODUCTS

Standard Adj. Multiple	Hi-Duty Single Spindle
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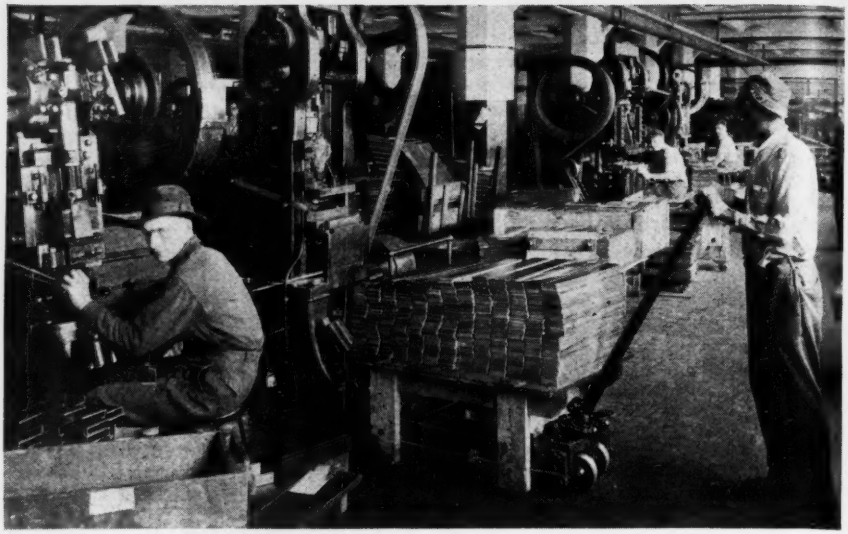
Single Purpose Automatic	Special Machines

May we give you a proposition on your "holes"?

THE NATIONAL AUTOMATIC TOOL CO.

RICHMOND, INDIANA, U. S. A.



Cutting Material-Handling Costs With Lift-Truck Equipment

By DONALD A. CLARK

MANY small shops have taken pages from the practices of the large production shops as applied to material-handling problems, the problem of handling and moving materials in the small shop being practically identical with that in the larger shop except that it is on a smaller scale. The old-fashioned wooden box or barrel as a container and the two-wheeled truck with which one lot of material at a time was moved about the plant have been eliminated by the modern hand lift truck and skids or platforms.

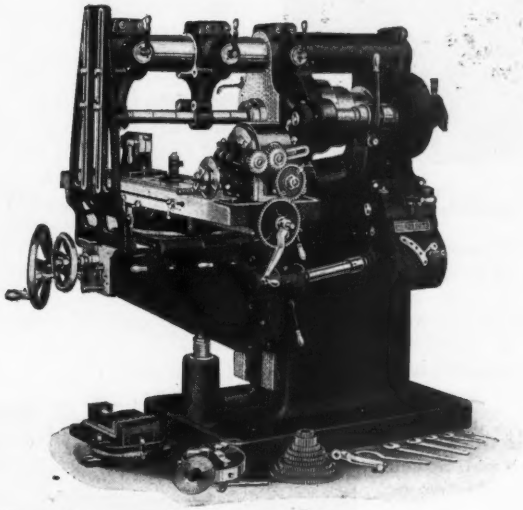
The skids and platforms are undoubtedly a little more expensive than the boxes and barrels which in former days were sent to the machine shop from the receiving room, carrying probably the same castings that they brought into the plant, but the savings in time and labor that have been made possible by the use of these skids have more than offset the skid costs. In fact, savings of as much as 90 per cent over former material-handling costs have been recorded.

Such savings can be credited largely to the wide range of utility of the hand lift truck. The every-day job of every small shop includes the handling and moving of piles of castings, forgings, cut bar stock, finished parts, assembled units, and supplies, all of which are alike to the hand lift truck, used in conjunction with a set of inexpensive skid platforms, skid boxes, and rack and table-type platforms. In many small shops these skids and platforms are made up by the shop helpers or repair men in spare time, reducing the investment to a mini-

(Photographs courtesy of the Stuebing-Cowan Co.)

LE BLOND
HEAVY DUTY
MILLERS

CONE TYPE OR SINGLE PULLY DRIVEN



A general massive design, rugged simplicity, tremendous driving power and operative convenience are reflected in increased productive capacity. Built in a complete line of sizes, cone type and geared driven, plain and universal for all milling requirements.

THE R. K. LE BLOND MACHINE TOOL CO.
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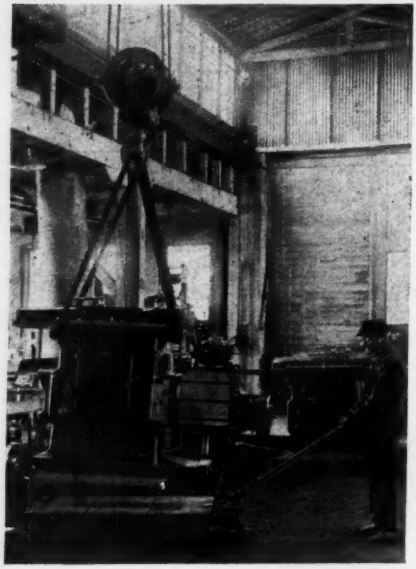

Setting a shaper on a platform at the plant of the Cincinnati Shaper Company.

mum. The nailed wood skid platform costing as low as from $1.50 to $2.00 is equal in utility to a four-wheel truck costing from $20.00 to $30.00.

The placing of material on skids promotes a system of identifying each load for each job or "run." By this method a line is drawn between live material, stock for storage, and defective or approved material, but the savings accruing from this orderly manner of handling the materials are only incidental to the big savings which are made possible by the actual use of the truck. The old way of moving a lot of, say, 75 to 100 castings, weighing perhaps 1,000 pounds, would have been to lift each casting and place it on a truck, or move a few castings at a time in such boxes or barrels as could be found around the plant, either of which methods took a considerable amount of time. In a shop that is using a lift truck, the castings are piled on a platform and when it becomes necessary to move them, the lift truck is rolled under the platform, the platform is raised off the floor by an easy movement of the truck handle, taken to its destination, and the operator steps on a foot pedal which releases the platform and allows it to settle gently to the floor. A hydraulic check prevents the platform from dropping suddenly when released. Cost records show that the lift truck system eliminates from 60 per cent to 90 per cent of the time formerly required to move materials, due to the elimination of unnecessary loading and unloading. With lift truck equipment, the operator spends all of his time trucking—getting the material moved, not piling and unpiling.

A comparison of the costs of using lift trucks as compared to the old-fashioned four-wheel or two-wheel truck shows that as the efficiency of the equipment increases, the costs decrease. The initial investment for

All parts are stored and moved in bins that are built up of sections at the plant of the Caterpillar Tractor Co., San Leandro, Calif.

Barnes Upright Drills

Barnes 22½-inch Stationary Head Drill with Silent Chain Motor Drive

With Stationary Head—
15, 20, 22½, 25-inch swing.

—

With Sliding Head—
22, 26, 28, 34, 42, 50-inch swing.

Gang Drills—
20 to 26-inch swing.

Barnes Upright Drills are made in a range of sizes from the 50-inch swing, required in the railroad shop, to the 15 and 20-inch sizes used in the small machine repair shop and garage service.

Arranged for Silent Chain or Belted Motor Drive. With or without Power Feed.

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Upright Drills
Horizontal and Vertical Production

Screw Presses
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The shapers are assembled on the platforms. This system promotes orderliness and general plant efficiency.

one hand lift truck with 25 inexpensive platforms would be approximately $150.00, whereas 25 four-wheel trucks would cost approximately $500.00. Thus the saving by the use of the lift truck would be $350.00. The maintenance costs on the lift truck, with only four wheels to take care of, and these four mounted on Hyatt roller bearings, would be much lower than the cost of maintaining the 25 four-wheel trucks with a total of 100 wheels, all mounted on plain bearings.

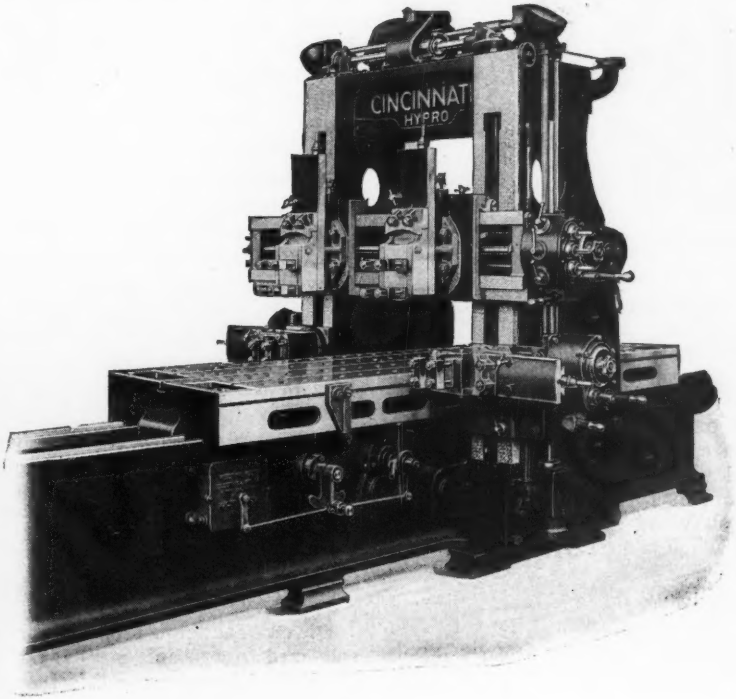
The flexibility of the lift truck system is probably the most important factor in its growing popularity. Castings, supplies, or finished units are handled on the flat type skid platform; the table type platform is used for handling flat stock or other material to punch presses, drill presses, and so on, and the bin, which is used with a base platform, is used for smaller parts. The bin is a four-sided section with guides on the corners so that a number of sections can be placed one on top of another and thus a tall bin can be built up. The bin can be built up at the machine, a new section being placed on as fast as the lower one is filled, and the sections can be removed again as fast as each becomes empty. Thus all the advantages of a huge bin are available, with none of the disadvantages.

Special types of containers are also used, designed to fit the job. One type of container is made for handling spindles, and is built so as to protect the finished spindles from damage. Contract shops engaged in the production of automobile parts use platforms with special racks for handling crankshafts and camshafts. In fact, special platforms can be made to handle practically any kind or type of product where the production is large enough to warrant it, but the majority of materials can be handled best on the ordinary flat platform.

Moving machine parts on a platform at the American Type Founders' plant.

The tendency throughout industry

CINCINNATI HYPRO-PLANER

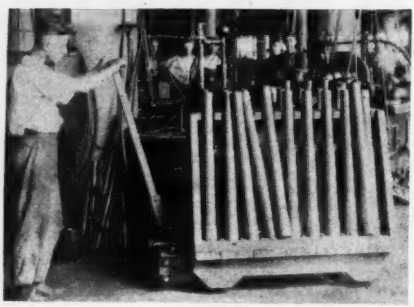


Selective Dial Feed, Instantaneous Rail Lift
Rail Clamp, Rapid Traverse and Forced
Lubrication are a few of the
Leading Features

THE CINCINNATI PLANER CO.

CINCINNATI, OHIO

everywhere is toward order and cleanliness, and there is no one item which is doing more to promote these objectives than the lift truck. The plat-



Machine-spindles are transported on special platforms.

forms keep the material off the floor and thus keep it in order, the various kinds of materials are properly segregated, and any lot of material can be moved at a minute's notice without piling or unpiling. In some shops units are assembled on platforms and moved along with the lift truck, instead of, as formerly, assembling the units on wood stringers and moving them, when necessary, by means of rollers.

The advantages and economies of this system are at once apparent to any who investigate it, and the number of shops who are using the lift truck is constantly increasing.

(Continued from page **18)**

loyalty, (2) discontent and dissatisfaction, (3) stealing, (4) juggling time, (5) lying, (6) appropriating the company's labor and material, (7) soldiering, (8) misrepresenting the company's policies.

In a discussion of corrective measures, the director emphasized the point that a spirit of service — not servitude—is desired. Before taking corrective measures, the foreman should set an example; he should obtain all the facts and not base judgment on hearsay; he should give the workman a chance to explain; he should be fair and give the workman a square deal; he should use good sense and judgment; he should create an incentive wherever possible. He should never humiliate a man nor injure his self-respect. He should keep rules alive and evident; should be firm; should not argue nor brook argument. As a last resort, and only then, he should set an example by discharging the man.

A record is kept of the proceedings of each meeting, and during the following week a report of the results arrived at by each group is sent to each foreman. Thus the members of each group are kept in touch with points that are brought out by foremen in the other four groups, which tends to increase the interest. In fact, the plant executives have become so interested in the conferences that no one is ever absent unless it is absolutely necessary.

Grinding Wheel Speeds

Do not condemn a wheel for being too hard or too soft until it has been tried at different speeds. Increasing the speed of a wheel makes it appear harder, and decreasing the speed gives the effect of a softer wheel. If the wheel is wearing away too fast and appears to be too soft, increase the speed. If the wheel glazes and is apparently too hard, reduce the speed. Make sure that the wheel is running as fast as it should. A wheel that is running slower than it should will wear down faster and at the same time will turn out a poorer quality of work than it would if it were running at the correct rate of speed.

No Machine Shop Complete Without "Buffalo" 12-Inch Hi-Speed Drill

AFTER half a century of successful designing and manufacturing experience, Buffalo has developed a drill many years in advance of the ordinary drill, namely, "BUFFALO 12" HI-SPEED."

The Buffalo 12" Hi-Speed Drill has four spindle speeds ranging from 3,600 to 10,000 R.P.M.; equipped with eight sets of ball bearings and tested at 12,000 R. P. M., insuring perfect balance and smooth running. A lever and rapid acting screw provide quick change of speed. Built to do a difficult job properly.

Further Details Sent On Request

Motor or pulley drive. Can be furnished with pedestals for floor mounting if desired.

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IN CANADA: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

We Are Tickled "Pink"!

WORDS of appreciation from readers telling us they like MODERN MACHINE SHOP keep coming in with every mail. It is certainly encouraging to every member of our entire staff to read messages like these:

"A magazine that fills the bill in every way. Appreciate receiving it very much. All success to you."—ARTHUR HODGKENSON, Superintendent, New Haven Machine Company.

"First issue I have seen. Is very interesting and I hope to be kept on mailing list."—J. O. BISHOP, M. M., National Supply Company of California, Union Tool Division.

"Please accept this as an application for the monthly MODERN MACHINE SHOP. *I am sorry that I was unable to enroll among the list."*—JAMES SULLIVAN, Machine Shop Superintendent, United States Radiator Corporation.

"Many thanks for your fine magazine. Will pass it along to someone else, after I have finished reading it."—CLIFTON W. BARNES, Estimating Engineer, Whitlock Coil Pipe Company.

"Your magazine has some very interesting articles and lots of valuable information. I thank you very much for receiving this publication."—FRANK HOLMES, Superintendent, Ft. Worth Steel & Machinery Company.

"Will you kindly send magazine to my home address at 1262 Humboldt Avenue, for I find it very interesting and want to have more time to read it over. Thank you."—GLEN G. HOLT, Hannum Manufacturing Company.

"Your MODERN MACHINE SHOP *is O. K. It is very interesting and instructive. It contains much in a little space."*—W. S. AUSTIN, Owner, W. S. Austin Company.

"I appreciate the MODERN MACHINE SHOP *and thank you."*—C. O. KRAGY, General Foreman, Pennsylvania Railroad Company.

"Many thanks for placing us on the mailing list. You have a very attractive magazine. Wishing you success."—W. W. CROOKER, Superintendent, Jas. Clark, Jr., Electric Company.

"You generally don't get something for nothing, but not the case with MODERN MACHINE SHOP, *for it fills the bill. Thanks to whoever sends it."*—E. D. PLAUGHER, Machine Shop Foreman, Ohio Steel Foundry Company.

"Am very glad to receive your magazine. Wish you every success."—C. M. PARIS, Machine Shop Foreman, The Pittsburgh Boiler & Machine Co.

"I will appreciate the magazine, feeling it will be a help in many ways."—L. L. HURLEY, Mill Superintendent, Trenton Cotton Mills.

"I have received your magazine and note that you are doing the world good. It is an Ideal for the purpose it serves. All I ask is that you keep up the good work."—WM. RALPH YAROS, Assistant General Manager, Kramer Automatic Tamper Company.

"I wish to thank you for the first issue of MODERN MACHINE SHOP. *For a long time I have waited for such a publication to appear on the stage."*—A. J. MACHEK, Amplion Outboard Engineering Company.

"Will you please add my name to your mailing list so that I may receive MODERN MACHINE SHOP *regularly?"*—G. S. KENNINGS, Chief Clerk, Beecher Shops, Detroit-Edison Company.

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"Very glad to have MODERN MACHINE SHOP. *It's very interesting."* KARL KLINGEMAN, Machine Shop Superintendent, Hahn Motor Truck Corp.

*"*MODERN MACHINE SHOP *is what is needed to give the workmen new ideas."*—N. A. PETERS, M. M., Ozan Gray Sonia Lumber Company.

"Many thanks for your magazine, which we find most interesting and helpful."—FRANK MISCHLER, Machine Shop Superintendent, W. E. Wright Company, Akron, Ohio.

"I am pleased with your magazine and thank you."—W. P. KING, Owner, W. P. King Electric & Machine Works.

"A good magazine."—E. P. STIMEL, Mechanical Engineer, Wm. Sealing Corporation.

*"*MODERN MACHINE SHOP *is quite an interesting publication and I am very glad to receive it."*—W. A. YOUNG, W. A. Young & Sons.

"Very interesting magazine and am pleased to receive same, wishing you good luck and success to which you are justly entitled."—EDWARD J. REESE, M. M., St. Louis Cordage Mills.

"We appreciate being placed on your mailing list. Your magazine can prove very helpful."—D. RAYMOND MCNEAL, Vice President and General Manager, Andale Company.

"Will say I like your magazine and wish you success."—F. M. WILSON, Master Mechanic, Fischer Lumber Company, Marcola, Ore.

In publishing these few excerpts from the many letters and coupons that we have received, we take this opportunity to again thank our readers for their expressions of appreciation. These messages prove to us that MODERN MACHINE SHOP is being read by the men we want to reach, and that our efforts to place interesting and useful material in the hands of our readers have been successful. We appreciate the return of the coupons; they assure us that our mailing list is correct, and no one places himself under any obligation by sending the coupon in.

If we made an error in your name, title, or address,

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Pointers On Drill-Grinding

FULLY 95 per cent of the difficulties encountered in drilling arise from faulty grinding of either the "point" or the "lip clearance." In grinding a drill, three things must be

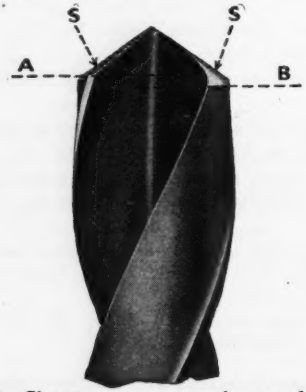

Fig. 1—Clearance on a properly-ground drill. Note how much lower the heel line B is than the point of the cutting edge A.

considered (a) lip clearance, (b) the length and angle of the lips, and (c) the location of the point and dead center in relation to the axis or center of the drill.

The term "lip clearance" is generally misunderstood. Lip clearance is the relief which is given to the cutting

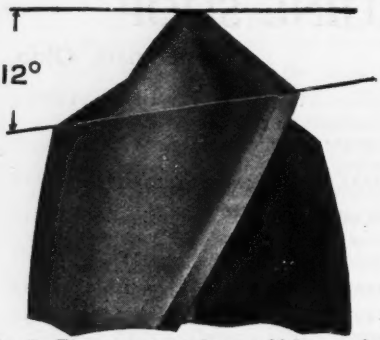

Fig. 2—The correct angle at which to grind the clearance.

edges in order to allow them to enter the metal without interference. If a drill were ground without any lip clearance, it would be impossible for the drill to cut into a piece of steel, because the surface of the drill point (indicated at S, Fig. 1) would always be in contact with the metal and would effectively prevent the cutting edge from biting further into the metal. Such a drill would merely rub

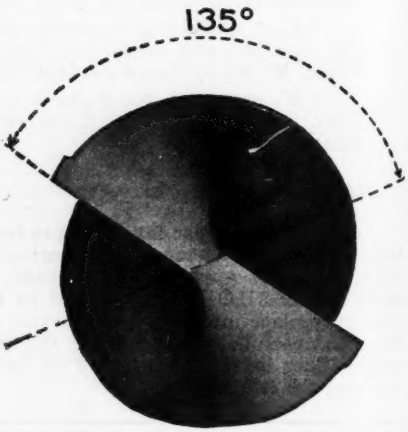

Fig. 3—Showing one way to gauge the correctness of the lip clearance angle.

around without penetrating. Therefore, if the lip is to penetrate, and if its edge is to cut, the surface S must be ground away back of the lips at an angle of about 12 to 15 degrees, as shown in Fig. 2. This angle is calculated at the circumference of the drill. The angle of lip clearance should be gradually increased, however, as the center of the drill is approached, and when the point is correctly ground, the line across the center of the web will stand at an angle of approximately 135 degrees with the cutting edges, as shown in Fig. 3. Failure to give the drill the correct amount of

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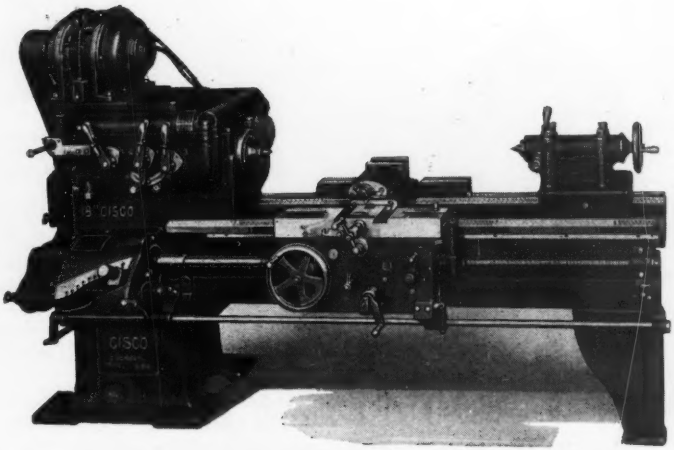

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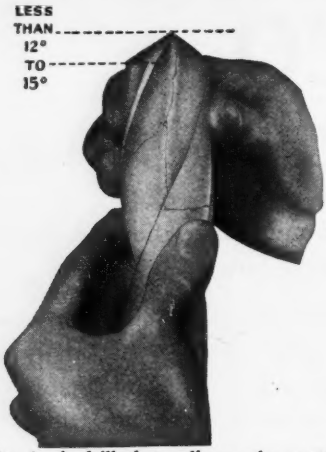


Fig. 4—A drill that split up the center due to being ground without enough clearance.

clearance is the principal cause of drills splitting up the center, as illustrated in Fig. 4.

If the angle of lip clearance is too great, the cutting edges will break down when the drill starts to work, as illustrated in Fig. 5. This is because the lips are too thin and have no support.

After the point is correctly ground,

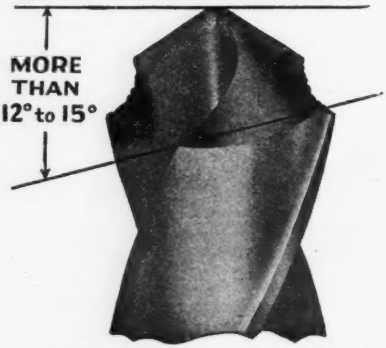


Fig. 5—Showing result of too much clearance. The cutting edges have broken down because of insufficient support.

the lips must be checked to make sure that they are of the same length, and that the angles of both lips are equal and correct in relation to the axis of the drill. An angle of 59 degrees is recommended as the best angle for all ordinary purposes, as indicated in Fig. 6. If the lips are ground at the same angle to the axis, and if they are of equal length, the point will be on "dead center," which is an absolute requirement.

If the angle of the cutting edges is more than 59 degrees, the drill will not center properly because the cone-

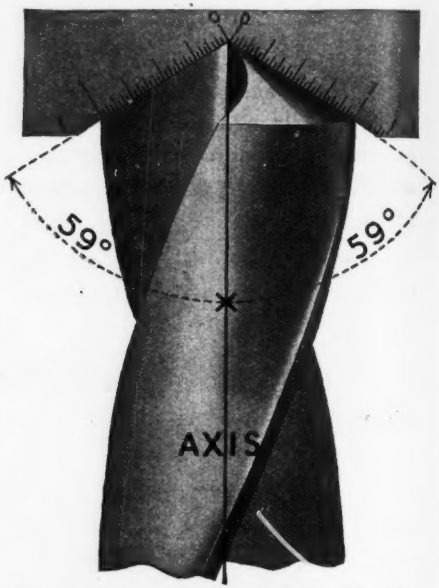
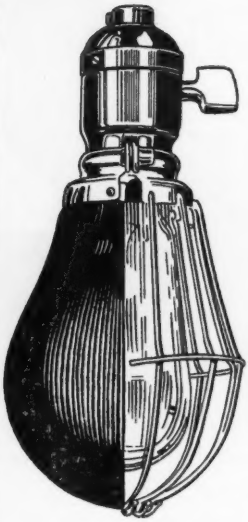


Fig. 6—A correctly-ground drill. The lips are of the same length and ground at the same angle to the axis of the drill.

shaped point, which should hold the drill in position, will be too nearly flat to perform its function properly. If the angle is less than 59 degrees, the tool will drill less rapidly and more power will be required to drive it, because of the additional length of the cutting edges.

If the drill is ground with the point in the center but with different angles on the cutting edges, the drill will bind on one side. All the work will be done by one lip—with resultant rapid wear on this lip—and the hole



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It doesn't take long to blind a workman with unshielded lights. The constant glare not only reduces the efficiency of the man, but tends to slow up production. McGill Reflector Guards direct the light where it is most needed and take away the glare that causes eye strain and personal injuries. In addition, the guards protect the lamp from breakage and prevent removal by any but authorized persons.

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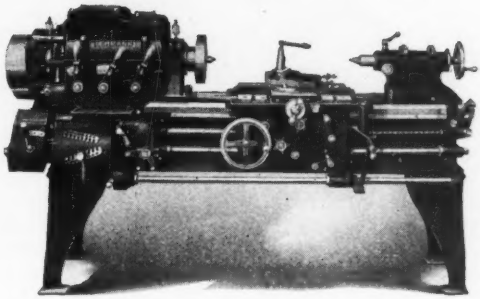

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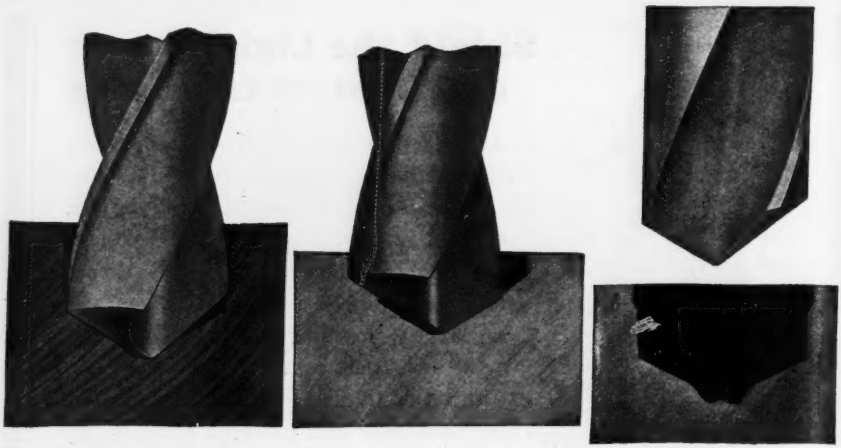


Fig. 7—Grinding the lips at different angles throws all the work on one lip, and produces an over-size hole. Fig. 8—Here the angles are equal but the lengths of the lips are different. This hole is also oversize, and the strain on the drill is heavy. Fig. 9—When a drill is ground as badly as this, it is usually broken by the strain.

will be larger than the drill. The effects of this condition are illustrated in Fig. 7. It may be found, after the drill has been ground, that the angles of the cutting edges are equal, but that the lips are of different lengths. In this case the point is, of course, off center. If the drill is used after being ground this way, a hole will be produced which will be larger than the drill. In other words, the hole will be oversize, as shown in Fig. 8. When such a drill is used, the resultant strain on the drill press is tremendous, causing "weaving" or wobbling of the spindle, rapid wearing away of the drill, breakdowns due to strains on the spindle bearings, and so on.

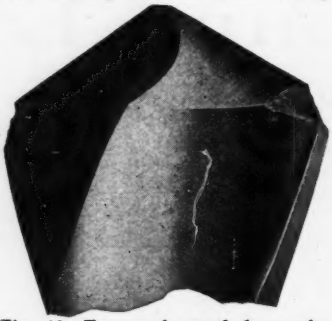


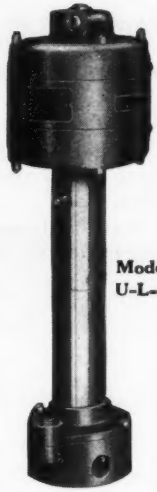
Fig. 10—Too much speed draws the temper and the corners of the drill wear away like this.

When the above faults are combined —unequal angles and lips of different lengths—both drill and machine undergo the maximum of abuse. The hole will be larger than the drill, Fig. 9, and the strain on both the drill and the press will be terrific.

A drill should be started in the work by hand feed until it is centered in the work, the power feed being thrown in afterward. If the drill chips at the cutting edge, it is a sure indication of too heavy a feed or too much lip clearance. When the drill splits at the web, the feed is too heavy for the amount of lip clearance. On the other hand, too much lip clearance will cause the cutting edges to chip. Before reducing the speed or feed, the mechanic should make sure that the drill is properly ground. If the drill is properly ground and the extreme outer corners of the cutting edges wear away as shown in Fig. 10, the tool is running too fast. When the job is

(Continued on page 60)

Gusher Pumps



Model
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THE IDEAL COOLANT PUMPS

The "GUSHER" line is the last word in Machine Tool Coolant Pumps. They are built to outlast the machines they serve. No packing nuts, no foot or relief valves, no priming—no trouble.

The menacing effects of grit, dirt and small chips have been done away with through proper engineering and construction.

Motor or belt driven "GUSHER" Models can be effectively used on both new and used machines. They are easy to install.

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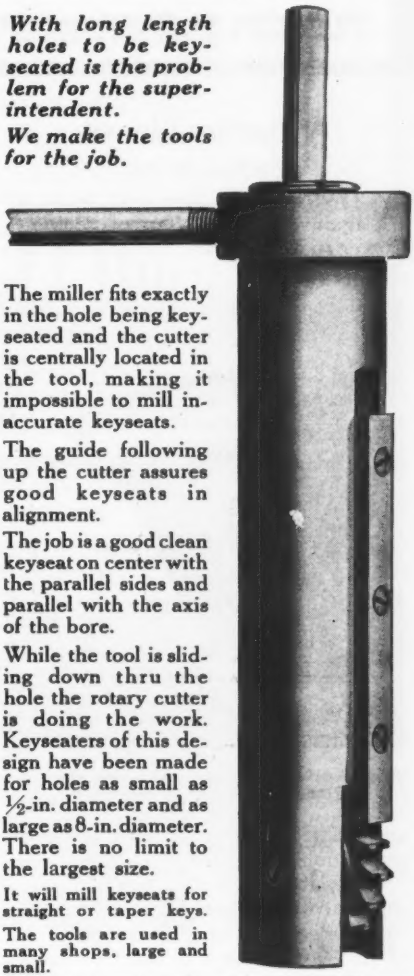
BIG CASTINGS

With long length holes to be keyseated is the problem for the superintendent.

We make the tools for the job.



The miller fits exactly in the hole being keyseated and the cutter is centrally located in the tool, making it impossible to mill inaccurate keyseats.

The guide following up the cutter assures good keyseats in alignment.

The job is a good clean keyseat on center with the parallel sides and parallel with the axis of the bore.

While the tool is sliding down thru the hole the rotary cutter is doing the work. Keyseaters of this design have been made for holes as small as ½-in. diameter and as large as 8-in. diameter. There is no limit to the largest size.

It will mill keyseats for straight or taper keys.

The tools are used in many shops, large and small.

This tool is principally used in the drill press

Ask for Catalog Q

NATIONAL MACHINE TOOL CO.
2271 Spring Grove Avenue
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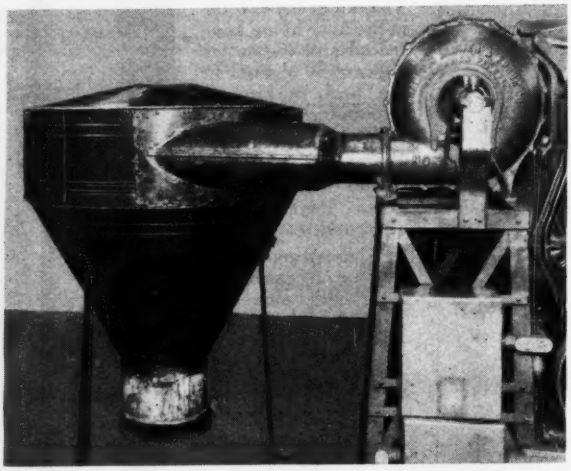
Ideas From Readers

This department is a clearing-house for ideas. If there are any "kinks" or short-cuts in use in your shop, send in a description of it. We will pay $5 for each one published.

A Pipeless Blower

By M. J. BRUSH

ANYONE who has ever been up against the problem of piping a blower to a wall many yards away will appreciate the method used to avoid this trouble and expense in our shop.



This receptacle catches and holds the dust from an internal grinding machine, no other piping being necessary.

We wanted to set an internal grinding machine in the most logical place for it, which was the center of the shop. Of course we had to install a blower to carry off the dust, which meant either running a blower pipe across a floor where trucks were constantly passing, or running it across overhead where the traveling crane passed frequently. Either was impossible. We finally decided to eliminate the pipe altogether, which was done by constructing the outfit shown in the illustration.

The dust that is drawn from the grinder is blown directly into a receptacle where it settles, the air passing out through the top of the receptacle clean and free from dust. The air enters at the side and travels around the inside of the receptacle, the centrifugal motion tending to throw the dust against the wall, where it settles and slides down to the bottom. Although there is a hole in the top of the tank, a pipe which extends downward from the hole prevents the dust from being blown out, while at the same time allowing the air to pass out after the dust has settled. At the lower end of the tapered portion is a short nose over which is slipped the round pan in which the dust finally settles. The pan is held in place by two hasps, one on either side, which make it possible to remove the pan quickly for cleaning. About three inches of water in the pan catches and holds the dust, and the pan is cleaned at regular intervals.

This outfit catches and holds the dust so effectively that no trace of

"CHAMPION" EXPANDING MANDREL

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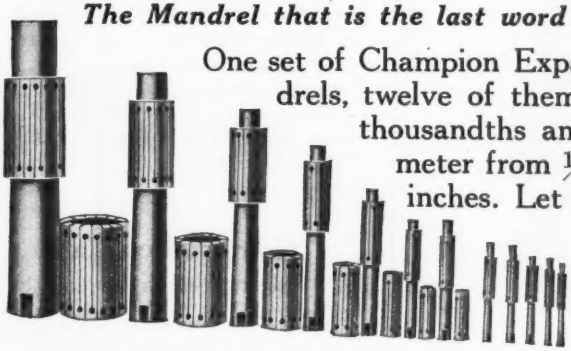

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Our No. 10 takes the place of sixteen Solid Mandrels graduated by sixteenths.

The WESTERN TOOL & MANUFACTURING CO.
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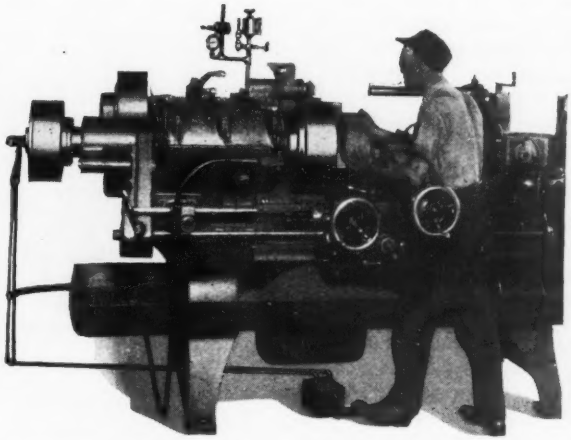
LOGAN



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There is a "Logan" Air Operated Device adaptable to all types of production machines, to meet every work holding requirement; fully described in the "Logan" catalog, sent on request.

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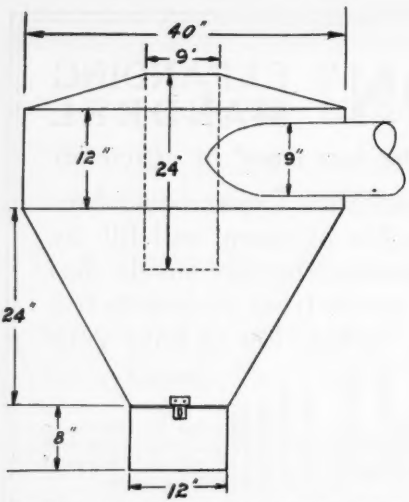


Drawing of dust receptacle, showing dimensions.

dust is ever seen in the air that issues from the top of the tank.

The blower is set up directly behind the grinder, as can be seen by reference to the photograph. The drawing gives the general dimensions, the dotted line indicating the 24-inch section of pipe which extends downward in the center of the tank. The tank is cheaply and easily made, and can be set up anywhere where a small amount of floor space is available.

Cottonseed Oil As a Lubricant

By Fred Stoll

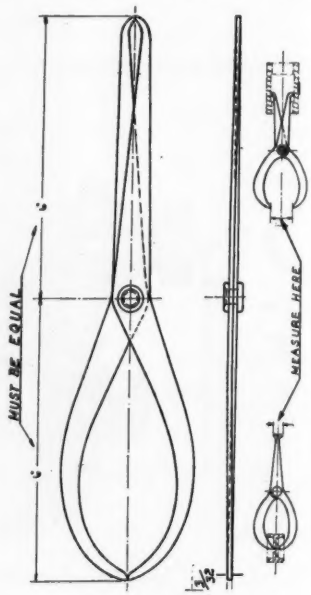
ONE of our men was given the job splining some small gears that were made of a particular grade of steel, and was having a hard time of it. The splines were ⅛ x ¼ inch in a bore 2½ inches long, and he was using a small Mitts & Merrill keyseater. The tool was the usual form of cutter used in this type of machine, cutting on the "pull" stroke and being fed to the machine by a wedge, but the cutters choked up and broke and he was about ready to quit. Putting lard oil on the cutters didn't seem to help any.

Finally he started experimenting with different kinds of lubricants, all without success until he squirted some cottonseed oil in the hole. His troubles immediately vanished. The cutter stopped choking and the job progressed without further trouble. We have never been without a can of cottonseed oil since.

Combination Caliper

By H. C. Kline

THE combination caliper shown herewith may be used for either inside or outside measurements independently, but its real value lies in the fact that it permits direct read-



A useful combination caliper.

The Rapid Drop Forged All Steel Clamp

Instantaneous adjustment, positive strength and rigidity combined.

Every Clamp Warranted

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Anderson Improved
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A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

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Multiple Units
From Single Drills

Designed to fit any type of drill press, a U. S. Drill Head converts any single spindle drill into a multiple unit quickly.

No time wasted making adjustments—spindles are fixed. Any number of holes, fifty if necessary, can be drilled as easily as one.

We will design a U. S. Multiple Drill Head to meet your individual requirements. Tell us your needs. Address

The United States Drill Head Co.
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Cincinnati, O., U. S. A.

ings to be taken on surfaces which cannot be reached by standard commercial calipers because of obstructions.

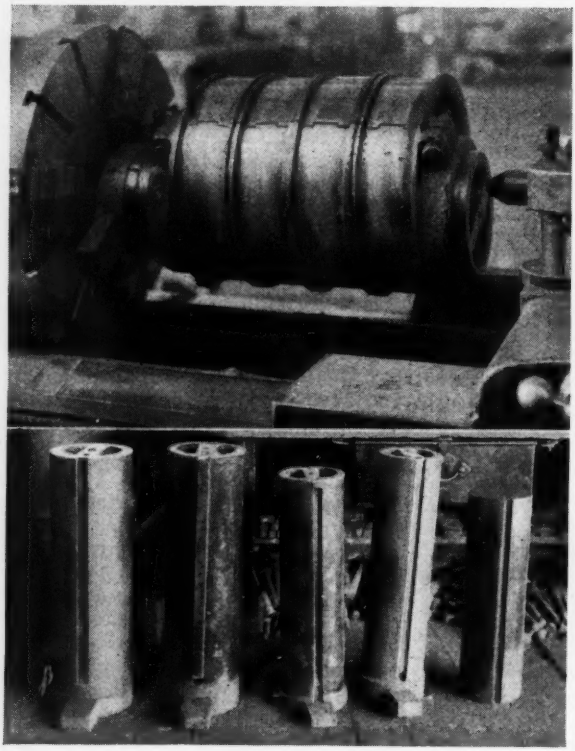
The construction of the caliper is similar to the ordinary ones now on the market, the points being exactly the same distance from the center so that the measurements at both ends are equal.

Internal diameters which are undercut for relief can be gauged while the tool is in the work, thus eliminating the chance of error which is always present when spring calipers are used. Ribs, flanges and other parts which are usually measured by oversize mikes and filler blocks, or else arrived at by deducting one or more dimensions from the overall, can be read directly by measuring the opposite end of the tool. There are innumerable places where a caliper of this kind can be used and if the fact that it is a little awkward to handle at first is overlooked, it will replace both inside and outside calipers in the mechanic's kit.

Eccentric Bushing Mandrels

By H. E. Barnes

THE photograph herewith shows a set of mandrels that are used to turn eccentrics in the Algiers shops of the Southern Pacific Railway. The set includes six mandrels, made to cover fourteen different classes of engines. Some of the mandrels are made with two centers, for two different classes of eccentrics, the centers in the ends of the mandrels being set off center an amount equal to the throw of the eccentric. The mandrel slips into the axle fit in the eccentric bushing, a keyway being provided for a key which also fits into the keyway in the eccentric. One of the illustrations shows a piece in a mandrel and in position in a lathe for turning.



(Above)—Bushing in position for turning.
(Below)—Set of mandrels for turning eccentrics.

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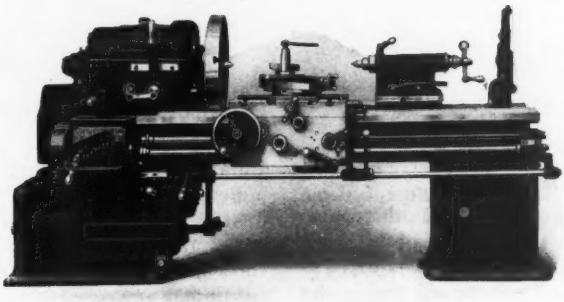
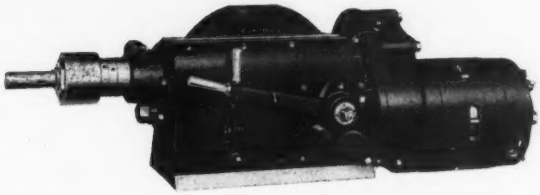
STETSON HAS USED BRADFORDS for twenty years



For more than 20 years the John B. Stetson Company, famous hat makers of Philadelphia, have been using BRADFORD Lathes, their latest addition being a 16" ALL GEARED. Precision, versatility, the power to handle heavy work smoothly and easily, and consistently profitable production—especially on short runs—are reasons why Stetson continues to buy Bradford lathes. Sizes 14" to 48" inclusive in ALL Geared and Cone Types—also all lathe attachments.

BRADFORD Unit Type Drill Heads Unit Type Tapping Heads



A self-contained motor driven unit designed for one or more heads built into one unit at any angle from horizontal to vertical. Made with 3" or 6" stroke for single or multiple drilling up to 1⅛" and tapping up to 1" in steel.

Sold as a separate unit or made up in a complete machine for any drilling job—
Send us your prints or samples for our production estimates.

THE BRADFORD MACHINE TOOL COMPANY

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Precision Lathe Builders Since 1840

MODERN Machine Shop

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By
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The Co-operation Is Appreciated

It seems right that upon this page, where we talk with our readers about the interesting and outstanding features of this enormous field, we should take a part of a column to also thank them for their excellent co-operation. When we stated that all we asked in return from the readers whose names had been placed on our circulation list was the opportunity for our advertisers to submit specifications on needed equipment, we expected a certain amount of returns, but we had no idea that the total would be so large. Our readers will undoubtedly be surprised to know that, during the last few weeks, inquiries for literature and prices on more than a quarter of a million—$250,000—dollars' worth of machine shop equipment have come to this office, in addition to the many inquiries that have been sent direct to the advertisers.

That is real co-operation! Good wishes are fine, and we appreciate them, but a request for specifications and prices from a reader who is in the market for equipment is more helpful. The manufacturers who are represented among the advertising pages of this magazine are among the most progressive in the country. Most of them are leaders in their respective lines. It is through their co-operation, crystallized into a progressive idea, that this magazine has been placed, without charge, in the hands of the executives in nearly 25,000 machine shops throughout the country.

Co-operation is the most productive force in the business world today and when it is extended by one progressive firm to another, everyone concerned must benefit.

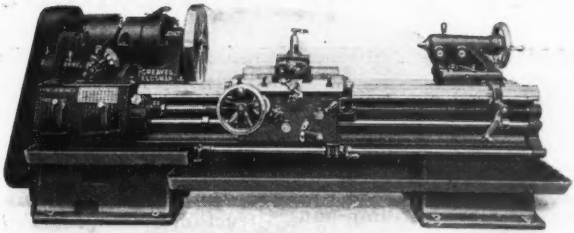
Business Barometer Rising

In spite of the general superstition about "presidential election year," the indications are that the wheels of industry will soon be turning at top speed again. The last quarter of 1927 showed a slowing up of activity which continued into 1928, but each month of this year has showed an increase over the preceding month and the beginning of the third quarter has established a belief that the year's record will far surpass that of 1927.

The American Iron and Steel Institute reports that steel ingot production in the first half of 1928 made a new high record in the history of the industry, and inasmuch as the demand for steel is considered a barometer of industrial activities, the outlook for the future appears good. The sheet, strip and tin plate mills all had the busiest July in their history, and these deliveries of steel stocks represent orders for steel products of many kinds which must yet be put through the manufacturing plants of this country.

Employment during July exceeded June by approximately 20 per cent, and skilled labor is being picked up rapidly. If election day finds us so busy that the majority of the country's voters have to take time off to vote, we may consider that the "election year" bugaboo has been relegated to the limbo of the old-time "money panics." And let us hope that it is so.

New Single Lever Control



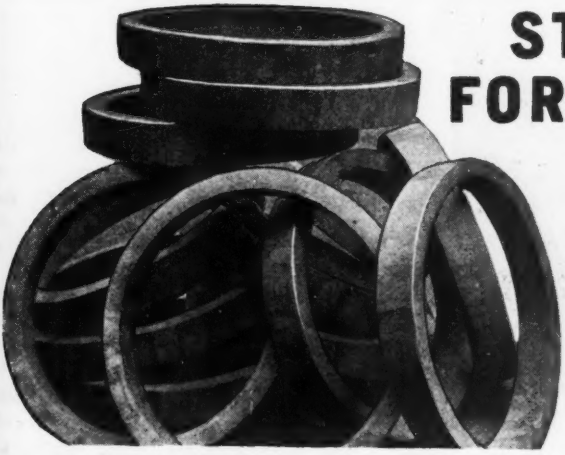
It is only necessary to move one lever to obtain any desired spindle speed in G-K Single Lever Control Heavy Duty Lathes.

This feature makes for high output with minimum operating energy.

An index plate shows at a glance how to obtain the necessary combination.

Many other profit-making features are found in these new tools, and we have detailed them all in our Catalog.

THE GREAVES-KLUSMAN TOOL CO., Cincinnati, O.



STEEL FORGINGS

WeldLESS Rings

WeldLESS rings are among the forgings we make — other products are spindles, gear blanks, hooks — an endless variety of forgings, each suited to its task.

The correct steel and a skillful touch here and there are the points that put Steel Forgings in the preferred class.

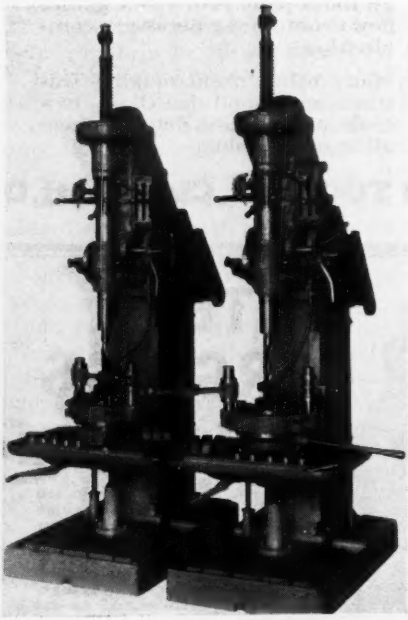
Your specifications will receive prompt attention.

THE STEEL FORGINGS CO. Cincinnati, Ohio

New Shop Equipment

Barnes Self-Oiling All-Geared Drill and Tapper No. 242

A self-oiling, all-geared drilling and tapping machine, known as the No. 242, has been placed on the market



Battery of two Barnes All-Geared Drilling and Tapping Machines

by the Barnes Drill Company, 801-851 Chestnut Street, Rockford, Ill. A battery of two of these machines, equipped with Foster-Barker 12½-inch 3-jaw vises and quick-acting bushing guides for drilling gear blanks, is shown in the illustration.

The machine is of the usual Barnes sturdy construction, the head being exceptionally thick from front to rear, where it is flanged and securely bolted to the massive column. This construction minimizes the tendency to deflection caused by the thrust load necessary to drive high speed drills at the maximum working efficiency. The table is also rigid and spacious, and well supported.

The speeds are controlled through a set of heat-treated alloy steel gears operating on a six-splined sliding gear shaft, and the feeds—from .005½ to .062 inch—are obtained through eight change spur-geared feeds. A six-splined spindle is used, eliminating the use of crown gear keys, and operating in a steel sleeve in which the rack teeth are cut integral. The torque is taken by hardened rollers free on the cross spindle. Both the spindle sleeve and sleeve housing are bronze bushed. Spindle speeds of 708 r. p. m, or faster if desired, can be obtained.

The speed change transmission is equipped with eight Timken tapered roller bearings, and the drive shaft and cross spindle are equipped with six Fafnir radial ball bearings, two separate Timken bearings and a roller thrust bearing being provided on the spindle. The drift hole in the spindle is below the sleeve.

The head has an enclosed self-oiling multiple disc clutch gear for driving, with a band brake which automatically and instantly stops the gears when the clutch is released, thus stopping the rotation of the spindle. For tapping, a reversing multiple disc clutch and two gears are added, con-

trolled by a convenient lever. All control levers are brought to the front of the machine for convenience in changing speeds and feeds. The Barnes star-wheel handle, located on the right-hand side of the machine, and an internal gear construction which gives a hand leverage of 35 to 1, are used.

The quick change geared feed unit is entirely enclosed inside of the main frame of the machine, eliminating the feed box with worm and worm gear. Slip gears for changing feed ratios may be quickly mounted. An automatic stop which gives the full spindle travel is also provided.

The capacity of the machine is ⅜ inch to 2 inches, using high speed drills in solid steel. The machine will give a 2-inch high speed twist drill at a speed of 177 r. p. m. (90 ft.), using a feed of .022 inch in steel, under test.

The machine is 8 feet 4 inches high, has a swing of 24 inches, and occupies floor space 50x35 inches. Distance from column to center of table, 12¼ inches; vertical travel of spindle, 14 inches; vertical travel of table, 23 inches. Weight, 2,600 pounds; crated, 2,800 pounds.

Armstrong Spring Cutting-Off Tool

Cutting off work in the lathe, always regarded as the most difficult of lathe operations, has been made comparatively simple by the development of a spring cutting-off tool that has been placed on the market by Armstrong Bros. Tool Co., 328 North Francisco Avenue, Chicago, Ill.

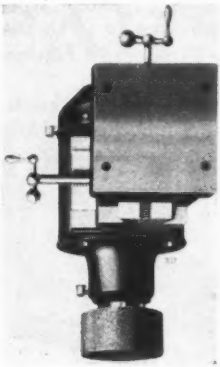
The feature of this tool is the "goose neck" which provides a resiliency that absorbs the chatter and keeps the work from climbing up on the tool, thus eliminating the cause of practically all cutting-off tool breakage. The cutter is a section of high-speed steel, beveled on both

Armstrong Spring Cutting-Off Tool

sides and held at an angle which gives the correct side clearance and top rake for a clean, smooth cut. The only grinding required is at the end of the cutter. The holder is of standard size for use in the standard tool post. Each tool is boxed separately. A wrench is included as equipment.

"Hisey" Vertical Spindle Grinder

The illustration herewith shows one of the three new types of vertical spindle grinders that have been placed on the market by The Hisey-Wolf Machine Co., Colerain and Marshall Streets, Cincinnati, Ohio. The machine is shown with the double slide adjustment, but these machines can be furnished with either single horizontal slide adjustment or with single vertical slide adjustment.



"Hisey" Vertical Spindle Grinder

The machines are intended primarily for thrust grinding with the spindle in a horizontal position, or

with the spindle swung downward at an angle. Each machine is of special ball bearing construction throughout, the bearings being constantly lubricated in an oil bath and fully enclosed in leak-proof chambers. When used in connection with a boring mill, planer, or other machine, many internal or surface grinding jobs can be done at one setting. Although built to afford toolroom accuracy, the grinders are of rugged construction and will meet the demands of general production work. The machines are made in 1, 2, and 5 h. p. sizes for alternating current, and 3-h. p. for direct current.

"U. S." Disc Sander

The illustration shows an electric disc sanding tool that is now being supplied to the trade by The United States Electrical Tool Co., 2471 West Sixth Street, Cincinnati, Ohio. Care has been taken to make this tool as sturdy and powerful as the other tools manufactured by this company, while at the same time balancing it so that it will be easy to handle and manipulate while in operation.

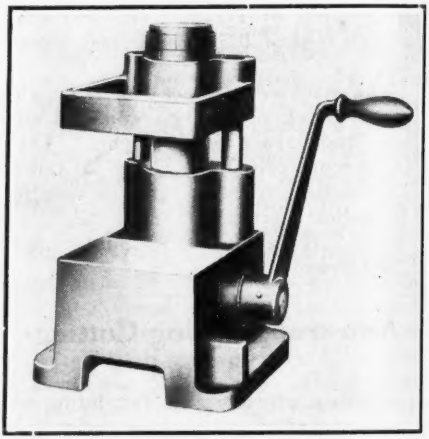
A fan-cooled motor of well-known make operates the 9-inch disc at 3,600 r. p. m. under load, this speed having been found, under test, to be the most efficient for this class of work. High-grade ball bearings are used throughout and the two-pole trigger switch in the handle, which is a feature of "U. S." construction, is included.

Fine, medium, and coarse sanding discs are furnished, together with 12 feet of flexible rubber-covered cable, two-piece attachment plug, and armored cable guard, which are regular equipment. The tool is nicely finished and presents a fine appearance. The weight is 12 pounds.

"U. S." Disc Sander

Siewek Rapid Drill Jig

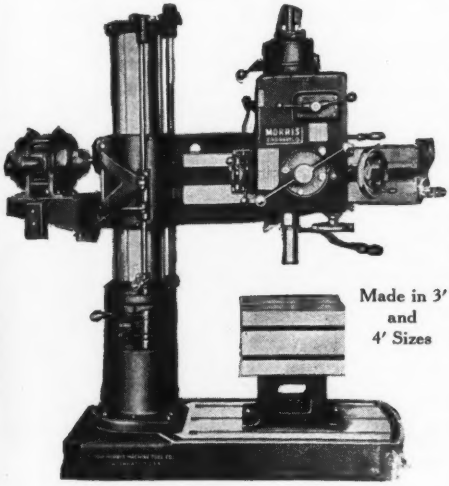
Drill jigs of standard types and dimensions, constructed with interchangeable parts, but adaptable to any



Siewek Rapid Drill Jig, Type "A."

work for which jigs of these various types can be used, are now being made for the market by the Siewek Tool & Die Co., 10232 Woodward Avenue, Detroit, Mich. The jigs are produced in a range of models and sizes which will include a wide range of machine products, and interchangeable bushing plates make it possible to adapt

"MOR-SPEED"—and we mean it!



Made in 3′ and 4′ Sizes

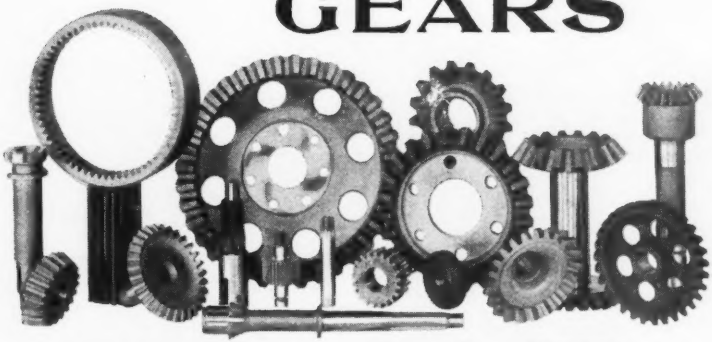
THE new Morris Radial was named "Mor-Speed" with intention. It was designed and built to place more power, more speed at the service of the user and it delivers the goods!

Timken Roller Bearings, hardened broached gears, heat treated multiple splined shafts and spindle, multiple disc clutch and efficient positive lubrication are only a few of the features incorporated in this new machine. Twelve speed changes from 125 to 1600 R. P. M., six feeds from .004 to .025 per revolution, power to drive a 3/16" drill 80 feet per minute, and sufficient power to drive a 1½" drill without difficulty.

THE MORRIS MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

GEARS



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Let us quote from your blue prints on your next requirements.

The Steel Products Engineering Co., Springfield, O.

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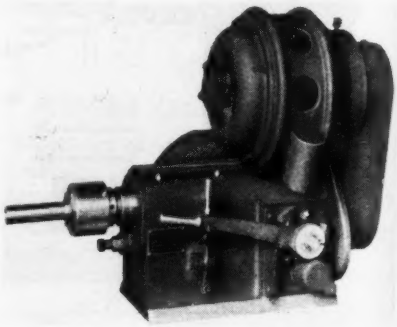
any jig to a number of different kinds of parts.

The design of the jig in general includes a base, from which projects a post supporting the head which carries the drill bushings. The post is raised and lowered by means of a lever, the piece being clamped or released with one movement, cushion clamping being secured by means of a heavy spring inside the post. The lever is connected with the post through a link by the use of which a high clamping pressure is developed with very little pressure on the lever. An adjustable lock nut holds the head in position while the piece is being drilled. Both the anvil upon which the work is located and the head that carries the bushings are interchangeable, thus providing for the drilling of many kinds of pieces in one jig. The design of the jig provides for ample loading clearance, chip clearance, and lubrication clearance. Bushing plates of certain standard designs are furnished as standard equipment when desired. Finish pads are provided on each jig for tool numbers.

Bradford Unit-Type Drilling and Tapping Heads

In order to make possible the drilling, reaming, hollow milling, countersinking, or tapping of work while it is in process on other operations, or to make possible a combination of spindles so that a piece of work can be drilled from several angles at the same time, The Bradford Machine Tool Co., 657-671 Evans Street, Cincinnati, Ohio, has developed the drilling head shown in the illustration.

The head is a complete unit in which are enclosed the motor and feed mechanism. The spindle is made from high-grade alloy steel with six splines, cut integral, and the spindle speeds can be varied through a range from 75 to 2,000 r. p. m. by means of pick-off gears located in the housing between the motor and drill head. Feeds from .002 to .030 inch per revolution are obtained by means of pick-off gears through which power is applied to a cam which feeds the spindle. The cam is designed so that the spindle approaches the work rapidly,



Bradford No. 2 Drilling Head, with Overhead Motor Mounting.

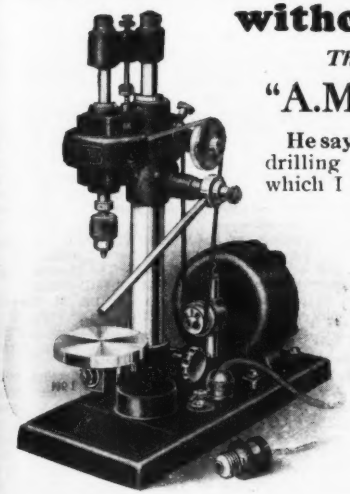
feeds through the actual cutting operation at the desired feed per revolution, and is returned at high speed after the operation is completed. The feed mechanism is released upon completion of the cycle and remains idle until again engaged by the operator.

The spindle nose has been designed to receive standard makes of multiple spindle heads, which can be either clamped around the spindle or bolted to a flanged quill. The tapping heads are made in three sizes, for tapping from 0 to ½ inch, ½ inch to ¾ inch, or ¾ inch to 1 inch, in steel. A thread lead of from 8 to 32 threads per inch can be obtained, a positive rise cam giving the spindle a lead corresponding to the tap lead.

Either the drilling or tapping head can be furnished with the motor

(Continued on page 60)

15,000 No. 68 holes drilled without breaking a drill!



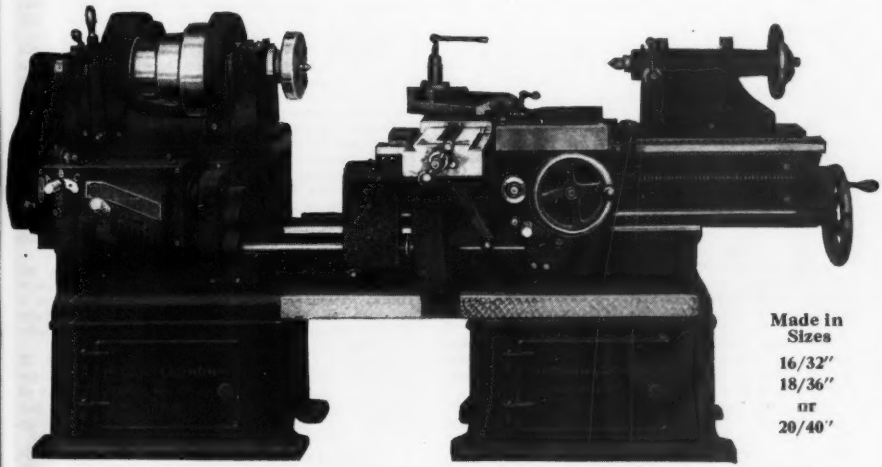
That is what one man did with an

"A.M." Sensitive Drilling Machine

He says: "You will remember the trouble I had with drilling No. 68 holes in parts for X-Rays, during which I broke several gross of drills. You may be interested to know that after setting up your No. 1 machine, I drilled 15,000 holes without taking the drill out of the chuck. No machine I have ever seen can compare with it."

No toolroom is complete without an "A.M." Sensitive Drilling Machine. Soon pays for itself on fine drilling work. Ask us for "An Outline of Economical Small Drilling."

ADOLPH MUEHLMATT
Fifth and Elm Sts., S. E., Cincinnati, O.



Made in Sizes
16/32"
18/36"
or
20/40"

Rahn-Larmon 18/36" Extension Bed Gap Lathe

A lathe for large or small swing work, ready at all times. Requires no extra rigging up. Takes different distances between centers.

Belt driven or with nine speed all geared motor driven head. Tell us what your requirements are and let us quote you.

THE RAHN-LARMON CO. **2935 Spring Grove Ave., Cincinnati, Ohio**

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Turret Lathes and Tools: Illustrated book describing Cincinnati Acme Turret Lathes and Screw Machines, and showing a variety of tools and fixtures for use with these machines. The Acme Machine Tool Co., 4955 Spring Grove Ave., Cincinnati, Ohio.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Stop Tap Breakage: A booklet that tells how to stop breaking taps, reamers, or other tools by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Avenue, Dayton, Ohio. Sent free on request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Metal and Wood Saws: Catalog No. 20 describing saws of all kinds, for both metal and wood. 256 pages of descriptions of saws and sawing machinery. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills, and horizontal drilling machines, has been issued by the W. F. & John Barnes Co., Rockford, Ill.

Bowsher Balancing Way: Gears, pulleys, fly-wheels, emery wheels, and other rotating parts should be properly balanced. This work can be done quickly and accurately on a balancing way that is described in a bulletin issued by The N. P. Bowsher Co., South Bend, Indiana.

"The Lathe With the Longer Life" is the title of a bulletin that describes the Coneless Lathes made by the Boye & Emmes Machine Tool Co., 2247 Spring Grove Ave., Cincinnati, Ohio.

Bradford Unit Type Drill Heads and Tapping Heads are described and illustrated in a bulletin published by the Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The bulletin also describes useful applications of these heads.

Combination Punches, Slitting Shears and Bar-Cutters. Two new large all-steel universal combination punches, slitting shears, and bar-cutters are described and illustrated in the new bulletin No. 325, published by Buffalo Forge Company 446 Broadway, Buffalo, N. Y.

Brent Buys Radial Drills: A story of the methods used by a plant executive to determine what type of machine is best suited to his purpose. Published by The Cincinnati Bickford Tool Co., Oakwood, Cincinnati, Ohio.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various type and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Shaper Progress: An illustrated catalog describing the various types of shapers made by the Cincinnati Shaper Co., Cincinnati, Ohio, and including descriptions of Cincinnati Shapers in use in different kinds of plants.

"The Lathe With the Pull" is the title of a catalog that has been published by the Cisco Machine Tool Co., 1765 Elmore St., Cincinnati, Ohio. The book describes the engine lathes, polishing lathes, and radial drill presses made by this firm.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on.

Disc, Expansion and Compression Clutches: The various types of clutches and their uses are discussed in an illustrated booklet that is issued by The Conway Clutch Co., 1959 West Sixth Street, Cincinnati, Ohio.

Die Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Danley Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock-Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Quick-Acting Clamp: A bulletin describing the "Rapid" drop-forged steel clamp manufactured by the Fountain Equipment & Mfg. Co., 2025 Elm St., Cincinnati, Ohio, has been issued by this firm.

Machinists' Tool Cases and Chests: The high grade tool cases and tool chests manufactured by H. Gerstner & Sons, 1254 Columbia St., Dayton, Ohio, are described in detail in catalog No. 27, which can be had by writing to this company.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Drilling and Grinding Electrically: Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

Modern Milling Equipment: A book describing and illustrating in detail all the parts of various types of milling machines and showing a number of ways of handling milling jobs will be sent free to the readers of this magazine by the Kearney & Trecker Corporation, Milwaukee, Wis.

Automatic Lathe Operation: The new Catalog No. 16, which has been published by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, describes the construction and operation of the LeBlond No. 16 Heavy Duty Automatic Lathe. A number of tooling layouts for use with this lathe are also shown.

Lehmann Lathes: Details of the outstanding features of Lehmann Lathes are given in a catalog published by the Lehmann Machine Co., 3560 Chouteau Av., St. Louis.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Lamp Guards: The various types and kinds of lamp guards made by the McGill Manufacturing Co., Valparaiso, Ind., for factory use are described in a catalog that will be sent free upon request.

The Ball Expansion Hand Reamer

THE BALL REAMER is different from the usual type of expansion reamer in that the body of the reamer is solid, with a pilot for guiding the reamer through the hole.

THE BODY of the reamer is hardened. The blades are set in the body of the reamer and are locked at each end by set screws.

THE BLADES are made of either carbon or high speed steel. The expansion of the blades in no way affects the truth of the body of the reamer as is the case in every type of expansion reamer where the body is split. Range of expansion, .030" to .045".

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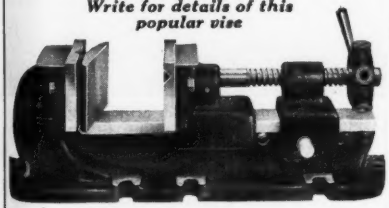

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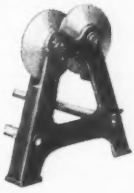

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Sundstrand Machine Tool Co.
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Modern Lathe Design: A bulletin describing and illustrating the features of the Monarch 16-speed Helical Geared Timkenized Lathe has been published by The Monarch Machine Tool Co., Sidney, Ohio.

Roller Bearing Radial Drills: The application of Timken roller bearings in the design of modern radial drilling machines is discussed in a bulletin describing "Mor"-Speed Radial Drills, published by the Morris Machine Tool Co., Cincinnati, Ohio.

An Outline of Economical Small Drilling: The subject of small-hole drilling is discussed in a booklet that is published by Adolph Muehlmatt, Fifth and Elm Sts., S. E., Cincinnati, Ohio. The booklet also describes the outstanding features in the construction of the A. M. Sensitive Drilling Machine.

"The 'Hole' Story in One Word" is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Natco" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

"Tool Room Grinding" tells how to sharpen milling cutters and how to grind drills, taps, reamers, lathe and planer tools, and dies. A number of drawings and photographs are shown, showing how to hold the tools for grinding, and the kinds of chips that should be produced by properly-ground tools, etc. Published by Norton Co., Worcester, Mass.

"Offset" Milling: A booklet that explains the offset principle of continuous milling and describes the applications of this method will be sent free to executives who address The Oesterlein Machine Co., 3319 Colerain Ave., Cincinnati, Ohio.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Rahn-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

Engineering and Manufacturing Service: A complete engineering and manufacturing service for manufacturers who are not equipped to handle all of their own designing, experimental, or production work is described, with illustrations of the equipment available, in a bulletin that is issued by The Steel Products Engineering Co., Springfield, Ohio.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-Em-Up" drill sleeves, "Wear-Ever" chucks, collets, cutters, reamer and tap holders, counterbores, spotfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Shop Furniture: A catalog describing and illustrating all kinds of shop furniture, including benches, vises steel stands, foremen's desks, chip trucks, steel racks for bar stock, steel tote boxes, and other equipment will be sent free upon application to The Western Tool & Manufacturing Co., 1620 East Pleasant Street, Springfield, Ohio.

(*Continued from page 56*)

mounted either at the end or on top, as required. The illustration shows the No. 2 drilling head with overhead motor mounting, which makes the gearing at the end of the head accessible, should change be desired.

(*Continued from page 42*)

started, the speed should be increased to a point at which the corners of the drill begin to show signs of wearing away, then it should be slightly reduced and maintained at this figure.

If, after the drill has been properly ground and the correct speed selected, the drill still fails to penetrate, it may be found that the material is exceptionally hard. The drill can be helped through a hard spot by a liberal dose of turpentine applied directly to the work. The drill can also be assisted by grinding the edges of the lips parallel with the axis of the drill and thus reducing the angle of the cutting edges so as to permit the use of a heavy pressure. When a drill is perfectly ground, a completely-rolled chip will be produced by each cutting edge similar to that shown in Fig. 11.

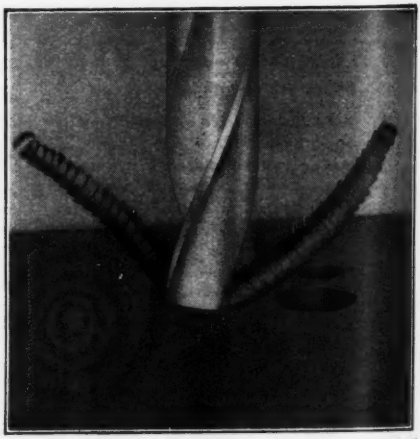

Fig. 11—A properly-ground drill in operation. Note how compactly the chips fit into each other.

(From "Handbook for Drillers," published by the Cleveland Twist Drill Company.)

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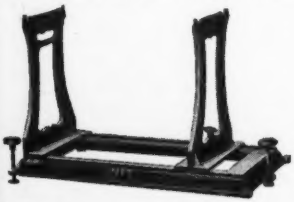

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are brought to an absolute *level* in ten seconds. No revolving parts.

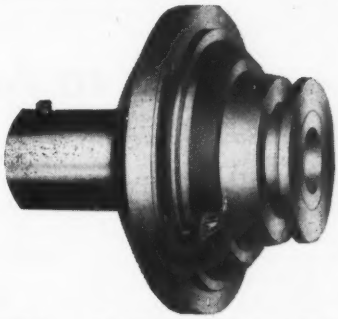
The edges or "knives" upon which the work is tested are ground *true*, and are mounted upon the planed "ways" of a heavy bed or frame.

Standards adjustable to suit length of arbor.

Three sizes for floor—one for bench use

Send for Catalog "H"

The N. P. Bowsher Co., South Bend, Ind.



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ONE of them on your line shaft will win your decision to adopt them throughout your plant.

The starting, stopping and full power development of your machines of production is important.

The morale of your men and the accuracy of their work depends on the kind of prime movers controlling their machines.

Buy the best and you'll choose the Conway Disc Clutch.

Write For Bulletin DC

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The Conway Clutch Co.
1959 W. 6th St., Cincinnati, Ohio

"There's a kick in the click of an efficient drive."

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Raver-in-Chief

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An' we're back
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Don't be so low down as to pull the high hat.

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Daughter's legs are skinny,
As daddy scans her shins,
'Tis then that he gets jokey,
He calls 'em safety pins.

Ossifer, Doo Your Dooty

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The fellow who goes looking for trouble rarely loses the way to a rumpus.

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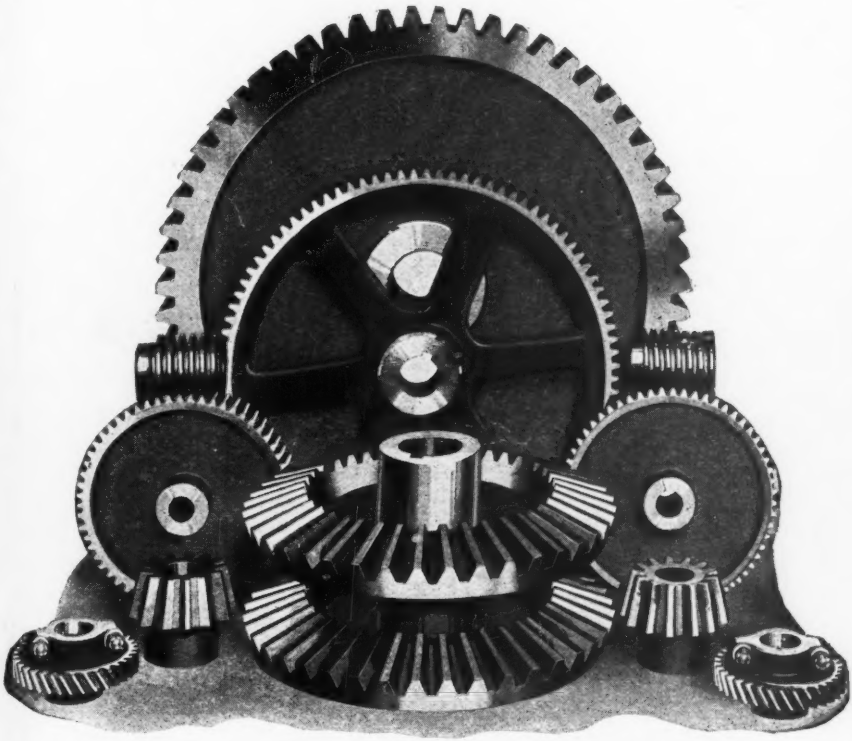

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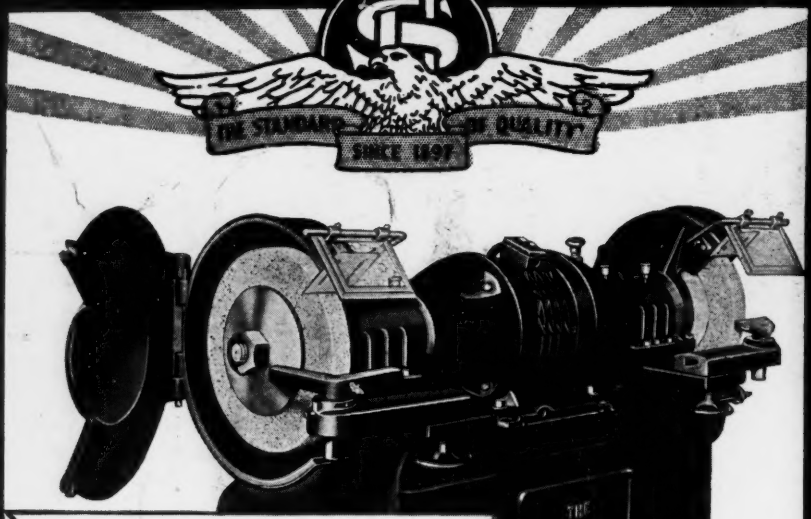

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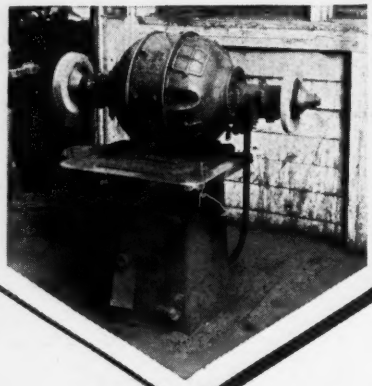

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